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ANALYSIS OF SELECTED GENERAL AVIATION STALL/SPIN ACCIDENTS.(U)
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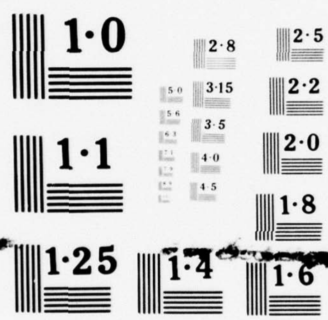

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ANALYSIS OF SELECTED GENERAL AVIATION STALL/SPIN ACCIDENTS

Jack Shrager

APRIL 1977

FINAL REPORT

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16. Abstract

An automated data search of existing general aviation data bases was employed in an effort to relate aircraft stall/spin accident history to general design characteristics. The technique employed utilized a chi-square analysis to evaluate a 9-year stall/spin history of 36 selected aircraft. The statistical analysis indicated that:

1. Accident rates are influenced by aircraft usage,
2. Accident rates are influenced by pilot experience,
3. Low-horsepower low-stallspeed aircraft have a higher propensity to stall/spin accidents,
4. The highest incidence of stall/spin accidents was in the takeoff phase of flight, and
5. With the exception of one aircraft type, the chi-square analysis did not identify specific aircraft designs or design categorizations which would have a higher propensity for stall/spin accidents, with all other factors (i.e., pilot experience, aircraft usage) constant.

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INTRODUCTION

GENERAL.

Stall/spin-type accidents represent only 8 percent of all general aviation accidents, yet they are responsible for 24 percent of all fatal or serious-injury-type accidents. Thus, if stall/spin accident data could be related to aircraft design or performance, aircraft usage, pilot experience, or any other identifiable parameter, this could become a tool to enhance aircraft safety. This has been recognized by all segments of the aviation community and has been the subject of several reports by both the National Transportation Safety Board (NTSB), and the Federal Aviation Administration (FAA).

BACKGROUND.

The Federal Aviation Act of 1958 empowered the FAA Administrator to "undertake or supervise such developmental work and service testing as tends to the creation of improved aircraft, aircraft engines, propellers, and appliances." Because of the number of accidents involving the pilot as a causal element, the FAA established a flight research program, entitled "Aircraft Design-Induced Pilot Error" (ADIPE). The first phase of this program was to assess the influence of airplane design factors or configuration on general aviation accidents wherein the pilot was determined to be a causal element.

The National Transportation Safety Board (NTSB) maintains computerized records of all aircraft accidents that occurred during and subsequent to 1964. In their efforts to emphasize the need for initiating new and innovative efforts aimed at reducing accidents, the NTSB, under sponsorship of the FAA, statistically evaluated the general aviation accidents for the year 1964. A chi-square statistical procedure was used to evaluate the data for significance by make and model within the selected causal factor groupings. The NTSB report (reference 1) provided the direction and extent of the current research and development (R&D) program being undertaken by the FAA.

The FAA's continuing effort undertook to expand the 1-year chi-square (χ^2) analysis of reference 1 to cover a 4-year base (1964-1967). The subsequent effort was further expanded to an 8-year base (1964-1971), again using the statistical techniques and selected general aviation aircraft defined in reference 1. The results of these FAA studies are contained in references 2 and 3.

A National Aviation Facilities Experimental Center (NAFEC)-sponsored contractual effort was undertaken to develop an experimental design, flight test program, and analysis procedure for evaluating the six most common accidents. For accidents as noted in reference 3, these accident types were:

1. Engine failure/malfunction,
2. Ground-loop/swerve,
3. Hard landing,
4. Stall, spin, spiral, or mush,
5. Overshoot, and
6. Wheels-up landing.

The objective of this effort was to develop an experimental design which would identify the basic aircraft design, maintenance, or human factors considerations which could be statistically related to previous NTSB accident data. The results of this effort are contained in reference 4.

A special study report by NTSB (reference 5) evaluated the general aviation stall/spin-type accidents from 1967 through 1969, again using a chi-square statistical procedure (equation 3, page 4). The purpose of this analysis was to determine if there was a difference in the accident rate for a given make and model of aircraft. One of the more significant facts was clarification of the implication of the chi-square analysis contained in reference 3.

Other related efforts undertaken by NAFEC were (1) to develop an experimental design for evaluating stall-warning devices to reduce stall/spin-type accidents, and (2) to evaluate the improved stall-warning equipment for general aviation. The first was essentially a literature search which resulted in a report (reference 6) that dealt with various experimental designs and includes recommendations. The results of the simulator experiment relating to the later effort are covered in reference 7.

The FAA's efforts were concentrated on an in-depth statistical evaluation of the stall/spin accident. The initial chi-square analysis was to be supplemented by a correlation procedure in an effort to define those aircraft characteristics (parameters) which may determine the propensity of some general aviation aircraft to the stall-type accident.

Other FAA investigations relating to the stall/spin problems of general aviation include (1) an in-flight evaluation of improved stall-warning equipment (reference 8) and (2) an in-house FAA spin-flight test program of a selected general aviation, single-engine aircraft conducted in 1965 at the FAA's Aeronautical Center in Oklahoma. Despite the above efforts, the stall/spin accident rate, as reported in reference 3, has remained fairly constant.

In 1972, NAFEC undertook an effort to reexamine the stall/spin accident history of 36 selected general aviation aircraft in an effort to develop a relationship between aircraft design and a given aircraft design's stall/spin accident history. This objective was not attainable due to the nonavailability of required design and aerodynamic characteristics of the selected fleet, and to limitations within the accident documentations. However, in the pursuit of this effort, several facts were uncovered which may have influenced or biased previous referenced efforts and publications. Among these were the evaluation of accident statistics without considering pilot experience, phase of flight type of aircraft usage, engine horsepower, landing gear configuration, etc.

OBJECTIVES.

The objectives of this report were to:

1. Evaluate and interpret the statistical inference of a generalized chi-square analysis of the stall/spin accident history of the selected general aviation aircraft fleet, and

2. Identify those factors which may be influencing general aviation stall/spin accident history.

METHOD OF APPROACH.

GENERAL. The following general aviation data bases were screened to form composite data for the statistical evaluation:

1. NTSB Accident/Incident Files 1964-1972,
2. FAA General Aviation Accident Files 1964-1972, and
3. FAA Aircraft Registration Files 1964-1972.

The aircraft study fleet employed was that used in the previous NTSB reports (references 1 and 5) plus one additional current-production aircraft. In this undertaking, it was initially decided to break down the study fleet by manufacturer, model, series, and engine (PA 28-140, PA 28-180, etc.).

The rationale behind the decision was that (1) there are known variations of the selected parameters within a given model (appendix A) and (2) there could be an undefined characteristic which may be influencing the longitudinal or lateral flying qualities. Thus, the fleet breakdown of the 36 groups included over 400 different aircraft classifications.

The structure and format of the NTSB data base are contained in the revised third edition of NTSB's Manual of Code Classifications, reference 9. The format of FAA's General Aviation Accident Files are denoted in reference 10.

The population, flight time, and usage for the selected aircraft fleet were obtained from the FAA aircraft registry files maintained by the FAA Aeronautical Center as reported on Aircraft Registration Form AC 8050-73 in accordance with Federal Aviation Regulation (FAR) 47.44.

The pilot experience was obtained from the information contained in the NTSB accident files. Thus, this data base consists only of those pilots who were involved in stall/spin accidents.

The resultant data base was examined automatically, using a NAFEC-developed computer program, to cull out and identify those factors (e.g., phase of flight, type of usage, landing gear configuration) which could bias or cloud the results of a statistical evaluation of the data base.

STATISTICAL ANALYSIS. Previous work by Acheson J. Duncan (reference 11) evaluated six single-engine, 65- to 85-horsepower aircraft using a chi-square test. In this analysis, a two-by-two contingency table (one degree of freedom) was set up using total accidents as a base. The following analysis was selected to statistically evaluate a given aircraft model's accident history for a given type of accident, phase of operation, and primary cause.

$$\chi^2 = (F_o - F_e)^2 \div F_e \qquad (1)$$

where

F_o = Observed number of a type of accident for a given model aircraft,
F_e = Expected number of a type of accident for a given model aircraft,

and

$$F_e = A_o \ (A_x \div A_t) \quad (2)$$

where

A_x = Total accidents for a given model aircraft,
A_o = Observed number of a type of accident for entire study fleet, and
A_t = Total number of all types of accidents for entire study fleet.

In reference 5, the NTSB report, AAS-72-8, the chi-square test was based on flight time (exposure) and one degree of freedom.

$$F_e = A_o \ (T_x \div Tt) \quad (3)$$

where

T_x = Total flight time for a given model aircraft, and
T_t = Total flight time for entire study fleet.

Another base of a chi-square test is population.

$$F_e = A_o \ (P_x \div P_t) \quad (4)$$

where

P_x = Total number of a given model aircraft, and
P_t = Total number of aircraft in the entire study fleet.

Reference 12 described a procedure for computing chi-square for contingency tables of two-by-three or larger (degree of freedom ≥ 2) using a tabular form as shown in tables 1 and 2. The analytical definition as used in this study is:

$$\chi^2 = \Sigma n \ (F_o - F_e)^2 \div F_e \quad (5)$$

It should be noted that equations 1 and 5 are not the same, with the latter being the explicit definition of chi-square.

The number of degrees of freedom for the two-by-three or larger tables was defined in reference 12 as:

$$df = (r-1)\ (c-1) \quad (6)$$

where

df = Degrees of freedom
r = Number of rows (independant variables)
c = Number of columns (conditions applicable to each variable)

The chi-square analysis used in this study examined the grouping of the stall/spin accident information by all three criteria; accident base (equation 2), exposure (equation 3), and population (equation 4) in lieu of just one. In addition, they have examined the premise of total independence by the combination of the number of engines, wing position, and horsepower (seven degrees of freedom), and finally, within each limited variable, interdependence (one degree of freedom).

TABLE 1. STRUCTURE OF A CONTINGENCY TABLE FOR CHI-SQUARE

	(Stall/Spin)	(Other Accidents)	(No Accidents)	Total Population
Single-Engine Low Wing	A_{o1}	$A_{t1} - A_{o1}$	$P_{x1} - A_{t1}$	P_{x1}
Single-Engine High Wing	A_{o2}	$A_{t_2} - A_{o_2}$	$P_{x_2} - A_{t_2}$	P_{x_2}
Twin-Engine Low Wing	A_{o3}	$A_{t3} - A_{o3}$	$P_{x3} - A_{t3}$	P_{x3}
Twin-Engine High Wing	A_{o4}	$A_{t4} - A_{o4}$	$P_{x4} - A_{t_4}$	P_{x4}
Totals	A_o	$A_t - A_o$	$P_t - A_t$	P_t

TABLE 2. TABULAR SOLUTION FOR CHI-SQUARE

Cells (1)	$R_n \times C_n$ (2)	F_e (2) $\div P_t$ (3)	F_o P_x (4)	$F_o - F_e$ (4) − (3) (5)	$(F_o - F_e)^2$ (5) x (5) (6)	(6) $\div$ (3) (7)
$R_1 \times C_1$	$(A_{o_1})\ (A_o)$	-	P_{x_1}	-	-	χ^2
$R_1 \times C_2$	$(A_{o_1}\ A_{o1})(A_t - A_o)$	-	-	-	-	-
$R_4 \times C_2$	$(A_{o4})(A_t - A_o)$	-	-	-	-	-
$R_4 \times C_3$	$(A_{o_4})(P_x - A_t)$	-	-	-	-	-

Using the criteria defined in reference 11, the relative rating and sign convention were computed as;

$$R = \chi \qquad (7)$$

where

R = Relative rating index

and

$$\text{Sign} = F_o - F_e$$

TEST RESULTS AND DISCUSSION

GENERAL.

The attempts to automatically correlate and classify NTSB and FAA data bases were limited for the following reasons:

1. The NTSB data base uses a five-character code (reference 13) which can cover several models within a given manufacturer or several manufacturers of the same aircraft. The FAA uses a totally different seven-character code (appendix A).

2. The NTSB codes separate stall (Q-), spin (Q1), spiral (Q2), and mush (Q3)-type accidents (reference 9). The FAA independently evaluates the accident information and independently classifies and codes the information. The accidents, in accordance with reference 10, in which the causal factor is classified by the FAA as a stall (Kx) would include both stall and mush, and those classified as spin (Lx) would include spin and spiral. In addition, based on the evaluation of the accident information, it may have been determined that a stall or spin causal factor could have been present in an accident which was not classified by NTSB as a stall or spin type of an accident. Thus, an accident which may have been defined as a hard landing by the NTSB, may be classified by the FAA as a stall which resulted in a hard landing.

3. The aircraft registrations data base (reference 14) reflects the annual aircraft population based on a quarterly statistics. Thus, an aircraft registered in the fourth quarter of one year would not appear in that year's annual statistical summary report. In addition, when an aircraft owner does not include a breakdown of aircraft usage, which is a voluntary portion of the registration form, a value is imputed when deriving statistics relating to aircraft hourly usage (exposure). Thus, in neither case, population nor exposure, are true values known for rate computations. The sensitivity to these deviations from exact quantities increases with the decrease in either the accident statistic or subdivision within a general aircraft model.

4. In the aircraft registration file, the first five characters were the same as those used in FAA's accident file; however, two additional characters were employed to identify a series within a model. An examination of the

microfilm of these data from the years 1964 through 1968 indicated that there can be and are variations in engine horsepower within a series that the seven-character code does not identify.

A cross-reference library was constructed to relate the FAA seven-digit code to the five-digit NTSB code and 36 groups of similar make and model aircraft. This cross reference and grouping is contained in appendix A. Some of the variables noted above are denoted in this appendix.

The correlation of the NTSB and FAA accident data information that was accomplished by using the aircraft registration number and reported accident date matched up 2,129 of the 2,496 stall/spin accidents reflected in the NTSB tapes for the selected fleet of aircraft. The remaining 367 accidents were reviewed manually to correct any obvious errors. No attempt was made to incorporate into the data base those additional 5,500 FAA-classified stall/spin accidents which were in excess of the NTSB information as coded.

STATISTICAL EVALUATION.

Figure 1 shows, in tabular form, the 9-year summary of NTSB-classified stall/spin-type accidents for the selected aircraft fleet by group number. There are 2,496 such accidents, identified from the NTSB tapes used of which 1,659 were the first (primary problem) accident type. This represents approximately 8 percent of all the accidents in which these groups of aircraft were involved during the 9-year time frame under consideration. Since the number of accidents for any given aircraft group would be influenced by the number of aircraft, flight hours flown, etc., an analysis with respect to the absolute number of accidents only, would be limited at best. This limitation was noted in reference 9.

Figure 2 indicates the accident data as a rate function with respect to population (POP), flight time (EXP), and accidents of all types (ACC). Since three of the aircraft groups, namely, 19, 21, and 36, entered the fleet after 1964, their rates are zero prior to entry. One of these, 36, indicates a high stall/spin accident rate in all categories after entry.

An overview of all the groups indicates that rate, as a function of population (approximately 2.5) and flight hours (1.5), was fairly constant for all the years studied. This supports the 9-year study reported in reference 3. However, with respect to all accidents, there was a dramatic reduction (by a factor of 3) between the years 1964 and 1965, followed by an equally dramatic increase (by a factor of 2) between 1966 and 1967. The subsequent years reflected a slight annual increase from year to year.

A review of Federal Aviation Regulations (FAR) 23 and FAR 61 indicated that the only possibly related changes to FAR's during the 9-year time frame were 23-4 and 61-20. The former authorized the use of normal category aircraft to perform certain stalls and turns with bank angles up to 60°. The latter required training for private-pilot rating to include positive manual control of the aircraft by using attitude flight instruments.

A detailed review of figure 2 does not indicate any constant relationship between the three rate functions selected. This supports the limitation, noted in reference 12, of using accident data as opposed to flying time. This is true when considered as a group summary, yearly summary, or general aircraft group (i.e., single-engine, high-wing etc.). For purposes of clarity, the groups are listed in figure 3 by accident rate for each category, with the highest accident rate first. The lack of consistency in the rate functions is noted in figure 3 for several aircraft groups by the dotted, dashed, and dash-out lines.

PILOT EXPERIENCE.

Since some form of pilot error is usually present as a factor in accidents, an effort was made to classify the experience of those involved in stall/spin accidents, thus providing a means of minimizing this masking of the aircraft's characteristics. The breakdown of the accidents within the three pilot-experience classifications for the 9-year period is shown in figure 4. As noted in figure 4, there are six experience groupings within each experience classification.

TOTAL TIME (TT). An evaluation of the totals shown in table 3, indicates that the accidents are uniformly distributed across the five experience levels defined, with one exception, the 300-t0-500 hour level (TTC). The number of accidents in this group is approximately one-half of any of the other four.

Breaking down the data into general horsepower (HP) categories by increasing horsepower, as identified in reference 14, the results shown in figure 4 reflect the percentage distribution as shown in table 3.

It can be seen in table 3 that there is a marked difference in the percentage of single-engine stall/spin accidents, (HP category A through C) in the experience level TTC. This is also borne out in the accident totals by pilot experience level as shown in figure 4. Again referring to figure 4, with the exception of experience level C, there is a reduction in the number of stall/spin accidents for single-engine aircraft with increase total pilot experience.

The twin-engine data reflect a progressive increase in the percentages with respect to the data in table 5. This is to be anticipated, since pilot training and initial experience is usually developed in the low-cost, low-performance, single-engine aircraft and moves progressively to higher performance single-engine aircraft prior to flying twin-engine aircraft.

It should be noted that specific trend data cannot be inferred from the information presented, since the number of pilots in each experience level is unknown. These data only relate to those pilots which made up the stall/spin accident population. Another limiting factor in attempting trend definitions is the effect of experience level (flight time) grouping (i.e., another grouping may indicate another percent breakdown).

TIME IN TYPE (TIT). A breakdown of the information in a manner similar to total time above is shown in table 4.

TABLE 3. PERCENTAGE OF ACCIDENTS PER PILOT TOTAL TIME EXPERIENCE

HP Cat. Ref. 14	No. of Engines	No. of Accidents	Pilot Experience Category A	B	C	D	E	Z	Total	Pilot Hours Total Time
A	SE	1,367	27	23	12	19	16	4	101	TTA = 0-100
B	SE	514	23	31	11	16	16	3	100	TTB = 101-300
C	SE	392	10	22	12	30	22	4	100	TTC = 301-500
D	TE	223	0	1	5	28	62	3	99	TTD = 501-1500
Group Totals		2,496	21	23	11	21	21	3	100	TTE = Over 1500
										TTZ = Unknown

TABLE 4. PERCENTAGE OF ACCIDENTS PER PILOT TIME-IN-TYPE EXPERIENCE

HP Cat.	No. of Engines	No. of Accidents	Pilot Experience Category A	B	C	D	E	Z	Total	Time-in-Type
A	SE	1,367	25	26	14	10	14	11	100	TITA = 0-25
B	SE	514	30	25	14	12	12	8	101	TITB = 26-75
C	SE	392	19	19	14	15	19	15	101	TITC = 76-150
D	TE	223	11	17	16	16	27	13	100	TITD = 151-300
Group Totals		2,496	24	24	14	12	14	12	100	TITE = Over 300
										TITZ = Unknown

TABLE 5. PERCENTAGE OF ACCIDENTS PER PILOT EXPERIENCE IN THE LAST 90 DAYS

HP Cat.	No. of Engines	No. of Accidents	Pilot Experience Category A	B	C	D	E	Z	Total	Recent Experience
A	SE	1,367	7	21	21	9	11	30	99	T90A = 0-5
B	SE	514	6	23	23	11	9	28	100	T90B = 6-20
C	SE	392	4	13	25	12	9	36	99	T90C = 21-50
D	TE	223	2	7	18	13	24	35	99	T90D = 51-100
Group Totals		2,496	6	19	22	11	11	31	100	T90E = Over 100
										T90Z = Unknown

There is a noticeable reduction in the percentage of accidents above experience level B for single-engine aircraft. This is most noticeable in the two lower horsepower categories C, A, and B. The percentages approach that of the twin-engine time distribution which is constant except for TITE (over 300). This mild anomaly could be a result of the experience-level grouping. In fact, the percentages of the largest horsepower single-engine aircraft are similar to that of the twin engine, yet the twins have the potential of lateral control problems associated with asymmetric power.

RECENT EXPERIENCE (T90). The percentage distribution of stall/spin accidents as it relates to the pilot's total known experience in the preceding 90 days is given in table 5.

Table 5 indicates that there is a marked reduction in the accident percentages (group D) for single-engine aircraft above the recent-experience level of 50 hours. This reduction is shown in all categories of single-engine aircraft, but is most pronounced in the two lower horsepower groups.

Another point of interest is the large unknown accident percentage figure for all aircraft--31 percent, compared with total time, 3 percent, or time in type, 12 percent. This could be due to the use of the total experience reported on the pilot's applications for a renewal of his or her medical certificate as opposed to specific information based on log book entry.

In all of the above pilot experience analyses, it is important to bear in mind that trend indications can be influenced by the scoring or grouping used in this or any analysis. Therefore, it would not be appropriate to assume any relationship between the pilot experience and specific or general aircraft design characteristics. However, all of the pilot experience categorizations used do reflect some functional dependence.

Since the automatic analysis did not reflect obvious pilot experience trend information as it relates to a given aircraft group or set of groups, no further effort was undertaken in this report with respect to pilot experience.

KINDS OF FLYING.

The distribution of the 2,496 stall/spin accidents by reported usage of the aircraft is shown in figure 5. The reported usage areas identified were;

Usage	Code
Instruction and Training	IT
Point-to-Point Transportation (Includes air taxi, executive, etc.)	PP
Low Altitude (Includes banner towing, fish spotting, etc.)	LA
Pleasure and Solo	PS

Aerial Application (Includes firefighting, crop dusting, etc.)	AA
Other Usage	OU
Not Coded	NC

The percentage distribution for usage by horsepower category is given in table 6.

TABLE 6. PERCENTAGE OF ACCIDENTS PER AIRCRAFT USAGE CATEGORY

HP Cat.	No. of Engines	No. of Accidents	Aircraft Usage Category IT	PP	LA	PS	AA	OU	NC	Total
A	SE	1367	22	8	6	54	7	0	3	100
B	SE	514	20	12	1	64	0	2	0	99
C	SE	392	9	26	1	62	0	2	0	100
D	TE	223	22	35	2	38	1	3	0	101
Group		2496	20	14	4	56	4	3	0	101

Table 6 indicates that among single-engine aircraft, those used in instruction and training in which stall/spin accidents occurred are the lower horsepower, lower operating cost aircraft. These percentages are similar to the distribution of total pilot experience, with the exception of category D, twin engine.

The percentage of stall/spin accidents which occur during instruction and training (IT) is as high for twin engine as it is for the low-horsepower single-engine aircraft. Pilot experience is shown to be much higher for those using twin-engine aircraft. This suggests that the twin-engine aircraft presents a problem to the higher experienced pilot during training which is at least as difficult as the problem presented to a new or low-time pilot in a single-engine aircraft. This observation is based on the similarity of stall/spin accident percentages noted in the preceding tables.

Those involved in the point-to-point category accidents are the higher performance, longer range, higher payload aircraft. As a general rule, there is a decrease in aircraft stability, with an increase in aircraft performance. With the exception of the twin-engine aircraft, all categories have similar percentages in the pleasure and solo usage category.

Figure 5 indicates that group 11 has a higher percentage and more accidents in the instruction and training phase than any other usage area. This group is a very popular, low-horsepower, modern training-type aircraft. Thus, it is not meaningful to attempt analysis without considering the usage history.

OPERATIONAL PHASE OF FLIGHT.

Figure 6 shows the number of accidents for each of the following identified phases of flight operations:

Phase	Code
Takeoff	TO
Climb and Descent	CD
Normal Enroute	NE
Approach and Landing	AL
Turning Flight	TF
Low Altitude	LA
Other	OT
Not Coded	NC

The percentage distribution by operational phase is given in table 7.

TABLE 7. PERCENTAGE OF ACCIDENTS PER PHASE OF FLIGHT CATEGORY

HP Cat.	No. of Engines	No. of Accidents	TO	CD	NE	AL	TF	LA	OT	NC	Total
A	SE	1367	33	3	6	10	9	15	21	2	99
B	SE	514	46	3	12	17	4	5	14	0	101
C	SE	392	43	4	11	15	8	4	15	1	101
D	TE	223	40	5	18	17	4	2	13	1	100
Group			38	4	9	13	7	10	18	1	100

These results indicate that the largest percentage of stall/spin accidents occurs during the takeoff phase of flight operations. It is true for all horse-power categories. This is that phase of flight in which there is a transition from speeds below stall, through stall, and to speeds above stall. This transition is usually from the backside to the front side of the power curve. The transition is accomplished by the exchange of the positive acceleration during takeoff to the steady-state velocity during initial climb. Thus, the aircraft's increased angle-of-attack with positive pitch change, with its related increase in drag, could preclude accelerating to the front side of the power curve. Aircraft which have a positive angle-of-attack during takeoff roll would have higher drag and hence, for the same horsepower and gross weight, lower acceleration.

A more detailed review of the data in figure 6 shows that 50 percent or more of all stall/spin accidents for 12 of the 36 aircraft groups happened during

the takeoff phase of flight. The majority of these groups are in the higher horsepower single-engine and twin-engine aircraft. The general design characteristic (i.e., wing position, landing gear configuration, tail design, wing planform) of these aircraft covers the complete spectrum of the selected fleet; therefore, it is not possible to relate the expected effects of design, as previously noted, to the resultant data shown in figure 6. The second largest segment of stall/spin accidents occurs during the approach and landing phase.

During both the takeoff and landing phase of flight operations, the speed margin above the stall speed is the least. In addition, the aircraft has the least available altitude which can be exchanged for additional speed. At these lower speeds, aircraft dynamics are nonlinear (reference 15) and would have to be taken into consideration in evaluating accident data. Such characteristics are not a requirement for certification of the aircraft.

CHI-SQUARE ANALYSIS.

The chi-squared statistical procedure determines if the difference between the actual frequency and expected frequency of an event is significant. The value of chi-square which could occur by chance at varied levels of probability and for varying degrees of freedom are statistically derived.

Shown on each of the chi-square analysis figures are the values of chi-square for one degree of freedom (all rows or columns being dependent variables or conditions) and for the number of degrees of freedom when all rows and/or columns (aircraft types) are independent variables. The chi-square values in each case are shown for varied levels of probability from 0.250 to 0.001. In reference 5, statistical levels of 5 percent (0.05) and 0.1 percent (0.001) were classified as "high" or "low" depending upon the sign, equation 8, and those differing beyond 0.1 as "very high" or "very low." Those whose chi-square values were less than that shown for the 5-percent level were considered average. It should be noted that reference 5 assumed one degree of freedom, based on this being the criteria used in reference 9.

ACCIDENT BASE. A contingency table was constructed to evaluate stall/spin-type accidents with respect to all other accidents (equation 1). In the initial analysis, each of the 36 aircraft groups was assumed to be independent variables, thus resulting in a 36x2 table. Shown in figure 7 are the results of this analysis of the 2,496 stall/spin accidents out of a total of 31,495 accidents. Using equation 5, the resultant value of chi-square identifies a very high significance for the summarized result.

A review of the results indicates that the rating is inversely related to horsepower. Accordingly, a new contingency table was constructed using the general aircraft categorization used in reference 14 for the selected aircraft fleet. The results of this 8x2 contingency table is shown in figure 8.

Within each of these general groups, a contingency table was constructed to generate ratings within the subgroups. These results are shown in figures 9 through 15, inclusive. Group 23 is the only aircraft with its subgroup. Accordingly, this and all other chi-square analyses by subgroup do not show group 23. It does appear in all other cases.

The analysis by subcategorization reflects a shift in the group order with respect to the general analysis. As shown in figure 9, group 35 has the highest rating value in its subgrouping, followed by group 27, 28, 2, 3, etc. In the general analysis (figure 7), the order is 27, 28, 35, 3, 2, etc. This suggests that a general approach (one degree of freedom) to statistically evaluating the potential sensitivity of a given aircraft group to stall/spin-type accidents can produce results which differ when the specific aircraft are categorized. This would be an expected variance if independant variables were assumed to be dependant variables. Thus, when these independant factors are not considered, the results could infer conclusions which are not correct.

A more detailed review of the data presented in figures 8 through 15 suggests that the aircraft could be classified and subclassified by (1) horsepower, starting with the lowest, (2) ground-attitude pitch, (angle-of-attack at the start of the takeoff roll) and (3) stall speed. Thus classified, the higher ratings are for the low-horsepower, conventional-landing-gear aircraft with high-camber wings. All the first five aircraft are high-wing, low-operating-cost aircraft. However, groups 10, 12, and 15 are high-wing, conventional-gear aircraft which reflect a lower-than-expected stall/spin accident rate (negative rating). The first five aircraft groups shown in figures 7 and 9 are aircraft which are certificated for intentional spins and have been used frequently for such training.

Those aircraft which have a positive rating, as shown in figure 7, and are not normally used for intentional spins, are groups 36, 7, 24, 33, 22, and 9. Four of these six groups are tricycle-gear, two are twin-engine, and four are low-wing. Four of these groups (namely, 36, 7, 33, and 9) are restricted from doing intentional spins. With the exception of groups 19 and 36, all of the single-engine aircraft with a positive rating value in figure 7 were designed and were in service prior to 1964. Eleven of the 13 aircraft with a positive rating are single-engine and, with the exception of group 7, have engines of less than 200 horsepower.

<u>POPULATION BASE</u>. A contingency table was constructed to evaluate stall/spin accidents with respect to the population ratio (equation 4). The criterion of structure was the same as that defined in the preceding accident-base analysis. Figure 16 reflects the relationship of the total accidents reported for the 9-year period (2,496) with respect to the summation of the registered aircraft within the 36 groups for the 9-year period. Thus, the average annual population was 100,286 aircraft for the groups under study, with an annual average of 277 stall/spin accidents.

In figure 17, the ratings do not follow the horsepower trend of the equivalent accident-base table. It does reflect the trend toward the more recently designed aircraft, due to their increase as a percentage of the total aircraft fleet size.

A further subcategorization by horsepower, wing position, etc., was also done. These results are shown in figures 17 through 24, inclusive. With the exception of the trend reflection noted above, these figures do not indicate any other identifiable aircraft characteristics.

EXPOSURE BASE. Shown in figure 25 is the 9-year summary, chi-square analysis by exposure (equation 3). This was the preferred analysis noted in reference 9. Since this analysis is based on the reported flight usage of each of the aircraft groups, it should be more sensitive to the flight and operational characteristics of the aircraft. It should also be influenced by the skills of the pilot. Rearranged by rating, the aircraft characteristic in the first 10 aircraft groups is conventional gear as opposed to tricycle-gear (ground-attitude pitch). Eight of the first 10 aircraft groups have conventional gear, one of which is low-wing as opposed to high-wing, and all are single-engine aircraft. However, they do not reflect increasing horsepower with decreasing positive rating index. Two of the first 10 aircraft groups listed, 36 and 19, came into production after 1964. Both are tricycle geared; both are in the midhorsepower classification; and one is low-wing, the other high-wing. The first 11 aircraft groups indicate chi-square values greater than the 0.001 level of probability for one degree of freedom (df = 1). Figure 26 highlights the low horsepower-to-stall/spin-accident relationship as demonstrated by the fact that the only positive ratings are for horsepower category A.

When restructured within this horsepower category, figure 27 (group 23 is the only low-wing aircraft in this horsepower category), group 27 has the highest rating. This is in keeping with the relationship between rating and horsepower, except that the range of horsepowers for this group is from 40 to 75, and neither NTSB nor FAA codes identify this specifically. There are other groups within all classifications which also have a range of horsepower that is not clearly defined.

Other factors which may relate to these subgroups are stall speed, wing area, and gross weight, since these vary in some degree with series within a model. As previously indicated, due to limited information in both NTSB and FAA aircraft data banks, the series within a model cannot be identified to allow such analysis.

Figures 28 through 33 show the results by other subcategorization. The order within the subcategories does not follow that of the population base. This is logical, since the usages of different aircraft groups are not necessarily the same.

KIND-OF-FLYING BASE. A series of contingency tables was constructed on the usage of the aircraft at the time of the stall/spin accident. The base criterion was the reported flight-hour distribution as reported by the aircraft owner's indication on the annual registration form. Those areas which were considered for this analysis were;

1. Instruction/Training (figure 34),

2. Point-to-Point Transportation (figure 35). This includes air taxi, executive flying, etc.

3. Low-Altitude Flying (figure 36). This includes pipeline patrol, aerial search, etc.

4. Pleasure/Solo (figure 37).

5. Aerial Application (figure 38).

6. Other Flying, not shown due to generalizations.

Instruction/Training. An examination of figure 34 indicates that 5 out of the first 10 aircraft by rating are not the low-horsepower, low-cost-type aircraft normally used as trainers. Three of these aircraft are high-horsepower, twin-engine aircraft.

Among the aircraft normally seeing significant use as trainers, three groups, 11 and 32, which are single-engine, and 30, which is a twin-engine, have negative ratings.

Aircraft groups 12 and 13 are similar in most respects, with the marked exception that the former has conventional landing gear and the latter is tricycle geared. Figure 34 indicates that group 12 has a rating of 10.70; whereas, group 13 is -5.52. Both have chi-square values significant at a probability of 0.001 for one degree of freedom, but at opposite ends of the spectrum. Similarly, groups 10 and 11, which differ significantly only in the landing gear design, have ratings of 3.72 and -4.10 and chi-square values which are significant at the opposite ends of the spectrum. A third, similar comparison is also true for groups 28 and 29, except these groups are manufactured by a different corporation; whereas, the other two sets were products of the same manufacturer.

Thus, even when categorized within a highly visible usage grouping, there appear to be anamolies in a χ^2 analysis when it is attempted to be related to aircraft design. This is not due to the statistical precedure, but rather its misapplication or misinterpretation.

Groups 6 and 7 differ significantly in their tail design. The former used independently fixed and movable surfaces for pitch and yaw control. Group 7 used a "V" tail configuration to provide both pitch and yaw. Both groups have positive ratings, 0.54 and 4.26; however, group 7's chi-square value is significant at the 0.001 level of probability.

Point-to-Point Transportation. Only one group, 22, is a low-wing aircraft among the first 10 rated in figure 35. Also, only one group, 29, is tricycle geared. Seven out of the first 10 are fabric-covered aircraft. Equally, 7 out of 10 have high parasitic drag.

Four sets of aircraft groups represent a comparison of aircraft which differs only in the landing gear configuration. These groups and their ratings are:

	Group	(rating)		Group	(rating)
1.	28	(20.84)	vs.	29	(4.21)
2.	10	(3.88)	vs.	11	(1.61)
3.	13	(-0.49)	vs.	14	(-0.13)
4.	15	(0.00)	vs.	16	(-2.46)

With the exception of the third set, the conventionally geared aircraft (lower parasitic drag) have a higher rating than their fixed-tricycle-gear counterparts.

Another observation relating to these sets is that within a given gear configuration, they become grouped in decreasing rating with increasing aircraft gross weight and performance (10, 13, 15 and 11, 14, 16).

Low-Altitude Flying. Only four of the aircraft groups in figure 36 have chi-square values which are significant at the 0.001 level. All have positive ratings. Three of these are single-engine, low-horsepower, and one group, 1, is a high-performance, twin-engine aircraft. All are high wing; however, the two groups with the lowest rating (highest negative value) in figure 36 are also high-wing aircraft. The latter have negative ratings and a chi-square value which is significant at the 0.005 level of probability.

It is important to note that high-wing aircraft offer the least restriction to downward visibility and would see preferred usage for pipeline inspection, fish spotting, banner towing, etc. Thus, the fact that three were high-wing can not be assumed to be a design stall/spin accident causal factor.

Pleasure/Solo. The first four groups of aircraft having the highest positive rating, shown in figure 37, are low-horsepower, single-engine, high-wing, high-parasitic-drag, fabric-covered aircraft. However, also included in the first 10 aircraft listed are high-wing with high-horsepower, low-wing with medium- and high-horsepower, and twin-engine aircraft, both high- and low-wing in design. All of the first 10 have chi-square values above the 0.001 level, and all have positive ratings.

At the opposite end of the table, the last eight aircraft groups are single-engine aircraft. Two of the eight are low-wing, all have negative ratings, and finally, all have chi-square values in excess of that expected at the 0.001 level.

Aerial Application. None of the aircraft within the study fleet were designed specifically for agricultural use or aerial application. Only one aircraft group, 34, (shown in figure 38) has a chi-square value which exceeds the 0.001 level of probability. All others, regardless of the rating sign, are significant above the 0.050 level. This aircraft group had design characteristics (low stall speed, high wing, and acceptable horsepower) which allowed its ready modification for aerial application.

OPERATIONAL PHASE OF FLIGHT. The results of the chi-square analysis by phase of flight are shown in figure 39 through 44, inclusive. The base criteria were all stall/spin accidents.

Takeoff. The results shown in figure 39 indicate that only group 28 is significant at the 0.001 level of probability, and it has a negative rating. The analysis does not indicate a general aircraft design characteristic which predominates at any level of probability.

Approach and Landing. The results indicated in figure 40 do not indicate any significance at the 0.001 level of probability. The general design groups previously identified are distributed throughout the results when placed in rating order.

Normal Enroute. Figure 41 shows that there is a significant value at the 0.001 level. The first four aircraft with the higher positive ratings are twin-engine aircraft, followed by three single-engine aircraft of more modern design. Those at the opposite side of the rating order are low-horsepower, single-engine aircraft of an older design. This is a reflection of what may be expected, since higher performance aircraft with greater range and seating capacities would see higher usage in this phase of operation. Conversely, low-performance, low-payload aircraft would see limited use in this phase of operations. Thus, while the analysis does have a significance, it is a reflection of the usage due to the design and not a deficiency of the design.

Climb and Descent. The results shown in figure 42 indicate no significant chi-square value at the 0.001 level. A review of the ratings indicates that there is a homogeneous distribution of aircraft by the number of aircraft engines, horsepower, wing position, and gross weight.

Turning Flight. The results shown in figure 43 indicate that group 28 is significant at the 0.001 level. Group 29 is very similar in design to group 28, yet it is at the other end of the rating order. Since the spectrum of horsepower for group 28 can vary from 90 to 250, it is not possible to assign a clear definition from this chi-square analysis.

Low-Altitude Enroute. Figure 44 indicates that low-horsepower, single-engine aircraft, especially those which see a high usage in flight instruction, have the higher positive ratings. The first two indicate a significance at the 0.001 level. Another characteristic of those aircraft with positive ratings is that they all are low in operating costs and slow, which makes them preferred aircraft for such usages as banner towing, pipeline inspection, fish spotting, etc. Again, their design may be dictating their usage and thus their sensitivity to the stall/spin-type accident.

CONCLUSIONS

1. The NTSB/FAA data bases employed in this investigation do not correlate. As a result, the full use of an automatic data analysis of general aviation accidents is limited.

2. Low-purchase-price/low-operating-cost aircraft have a higher usage in instruction and training. As a result, since the analysis reported herein determined that instruction and training have a high stall/spin accident rate compared with other usages, the accident histories of these aircraft would be and are greater than the more expensive aircraft with all other factors constant.

3. Low-horsepower, single-engine aircraft with positive initial angle-of-attack attitudes at the start of takeoff roll, show a higher propensity to stall/spin accidents, especially during the takeoff phase of flight. These are the same aircraft which see high usage in instruction and training.

4. In these stall/spin general aviation aircraft accidents examined, the most critical phase of flight is the takeoff.

5. The chi-square analysis indicates that in any accident rate analysis, aircraft should be statistically evaluated by horsepower classification and general configurations (i.e., number of engines and other performance factors which would influence usage).

6. With the exception of one aircraft type, the chi-square analysis did not identify specific aircraft designs or design categorizations which would have a higher propensity for stall/spin accidents, with all other factors (i.e., pilot experience, aircraft usage) constant.

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NINE YEAR ACCIDENT SUMMARY

GROUP	1964 FRST	1964 SCND	1965 FRST	1965 SCND	1966 FRST	1966 SCND	1967 FRST	1967 SCND	1968 FRST	1968 SCND	1969 FRST	1969 SCND	1970 FRST	1970 SCND	1971 FRST	1971 SCND	1972 FRST	1972 SCND	TOTAL FRST	TOTAL SCND
1	1	1	1		1	2	2	2		1	1	1	2	2	2		3		13	9
	2		1		3		4		1		2		4		2		3		22	
2		11	3	1	5	1	8	2	7	2	8	2	9	3	6		2		48	22
	11		4		6		10		9		10		12		6		2		70	
3	4	28	16	4	19	1	20	5	23	4	19	3	23	4	25	6	19	3	168	58
	32		20		20		25		27		22		27		31		22		226	
4		6	1		1	1	2	2	2	1	1	1	3		2	2	2	4	14	17
	6		1		2		4		3		2		3		4		6		31	
5	1	5			1	3	3	4	2	5		1	2	3	3	1	2	4	14	26
	6				4		7		7		1		5		4		6		40	
6		4						1	2				1		1				4	5
	4						1		2				1		1				9	
7	2	20	4	1	8	2	4	3	8	4	7	2	10	2	12	3	9	7	64	44
	22		5		10		7		12		9		12		15		16		108	
8		1				2							1	1			1		2	4
	1				2								2				1		6	
9		5	2	2		2	4	1	1	5	2	4	3	1		3	6	2	18	25
	5		4		2		5		6		6		4		3		8		43	
10	1	14	7		3	1	7	3	5	1	8		5	3	3		7	4	46	26
	15		7		4		10		6		8		8		3		11		72	
11	2	12	3	1	13		32	1	41	13	38	7	44	4	42	6	47	16	262	60
	14		4		13		33		54		45		48		48		63		322	
12		16	1	1	1		5	1	7	2	2	2	6			3	8	1	30	26
	16		2		1		6		9		4		6		3		9		56	
13		18	2	3	6	3	11	7	14	4	16	3	11	5	13	4	16	5	89	52
	18		5		9		18		18		19		16		17		21		141	
14		1	2				1	1			1	2	1		1		1		7	4
	1		2				2				3		1		1		1		11	
15		1	1			1			4		4	1	1		8	1	1		19	4
	1		1		1				4		5		1		9		1		23	

FIGURE 1. NINE-YEAR SUMMARY OF STALL/SPIN ACCIDENTS (SHEET 1 OF 3)

NINE YEAR ACCIDENT SUMMARY

GROUP	1964 FRST	1964 SCND	1965 FRST	1965 SCND	1966 FRST	1966 SCND	1967 FRST	1967 SCND	1968 FRST	1968 SCND	1969 FRST	1969 SCND	1970 FRST	1970 SCND	1971 FRST	1971 SCND	1972 FRST	1972 SCND	TOTAL FRST	TOTAL SCND
16	1	3	2		3		3	3	3	3	3	1	6	1	4	3	5		30	14
		4		2		3		6		6		4		7		7		5		44
17	1	2										1						1	1	4
		3										1						1		5
18	1	2	1		1	1					2	1	3		5	1	4		17	5
		3		1		2						3		3		6		4		22
19									7	1	7	2	4	4	6	1	2	2	26	10
										8		9		8		7		4		36
20	1	1		2			3			1	3	2		2	5	2	1	3	13	13
		2		2				3		1		5		2		7		4		26
21					1	1	2		1			1	1			4			5	6
						2		2		1		1		1		4				11
22		6			3	1	2	1	1	2	2		2	2	3	3	2		15	15
		6				4		3		3		2		4		6		2		30
23		6			2		2	2	3	1	4		3		2	2		1	16	12
		6				2		4		4		4		3		4		1		28
24	2	17	7	2	5	3	4	2	8	2	7	2	6	2	4	3	8		51	33
		19		9		8		6		10		9		8		7		8		84
25	1	5			7		13	1	8	3	3	5	4		6		3	4	45	18
		6				7		14		11		8		4		6		7		63
26		2	2		1	1	2		1	1		1	2		3				11	5
		2		2		2		2		2		1		2		3				16
27	3	28	12	3	16	3	[illegible]	3	27	10	22	5	21	2	17	9	14	3	155	66
		31		15		19		26		37		27		23		26		17		221
28	5	35	28		18	1	19	3	23		26	5	25	2	28	2	10	2	182	50
		40		28		19		22		23		31		27		30		12		232
29	3	21	3	2	4	2	[illegible]	3	4		5	2	3	4	3	1	7	3	42	38
		24		5		6		13		4		7		7		4		10		80
30		4	1	2	3	1	1	3		2	4	2	1	3	1	5	2	2	13	24
		4		3		4		4		2		6		4		6		4		37

FIGURE 1. NINE-YEAR SUMMARY OF STALL/SPIN ACCIDENTS (SHEET 2 OF 3)

NINE YEAR ACCIDENT SUMMARY

GROUP	1964 FRST	1964 SCND		1965 FRST	1965 SCND		1966 FRST	1966 SCND		1967 FRST	1967 SCND		1968 FRST	1968 SCND		1969 FRST	1969 SCND		1970 FRST	1970 SCND		1971 FRST	1971 SCND		1972 FRST	1972 SCND		TOTAL FRST	TOTAL SCND	
31		6	6	2		2	3		3	2	1	3	2	1	3	4	1	5	3	1	4	4	1	5	3	2	5	23	13	36
32	1	9	10	3		3	4	4	8	12	4	16	9	4	13	13	5	18	15	4	19	9	10	19	13	6	19	79	46	125
33	2	3	5	2	2	4	2	3	5	4	3	7	2	4	6	2	3	5	4	2	6	4	2	6	2	1	3	24	23	47
34		7	7	1		1	3	1	4	4	2	6	2	4	6	1	3	4	2	1	3	1	1	2	1	1	2	15	20	35
35	2	25	27	8	1	9	6		6	9	1	10	13	1	14	11		11	12	1	13	11	3	14	6	2	8	78	34	112
36														1	1	2	1	3	3	3	6	5		5	10	1	11	20	6	26
GRAND TOTAL	34	325	359	115	27	142	140	41	181	214	65	279	230	83	313	228	72	300	242	62	304	239	82	321	217	80	297	1659	837	2496

FIGURE 1. NINE-YEAR SUMMARY OF STALL/SPIN ACCIDENTS (SHEET 3 OF 3)

NINE YEAR SUMMARY OF STALL/SPIN ACCIDENT RATES
ACC = PERCENTAGE OF ALL ACCIDENTS THAT WERE STALL/SPIN ACCIDENTS
EXP = NUMBER OF STALL/SPIN ACCIDENTS PER 100,000 FLIGHT HOURS
POP = NUMBER OF STALL/SPIN ACCIDENTS PER 1000 AIRCRAFT

GROUP	1964 POP	1964 EXP	1964 ACC	1965 POP	1965 EXP	1965 ACC	1966 POP	1966 EXP	1966 ACC	1967 POP	1967 EXP	1967 ACC	1968 POP	1968 EXP	1968 ACC
01	2.12	.70	6.06	1.12	.36	2.44	2.81	.94	9.68	3.97	1.50	12.50	.97	.35	2.70
02	13.58	21.83	30.56	5.17	8.79	14.81	8.70	13.97	13.04	9.88	16.08	25.64	9.13	14.55	30.00
03	10.15	8.13	20.25	6.45	5.22	12.50	6.52	5.10	13.51	7.26	5.76	22.12	7.72	6.23	20.61
04	4.82	1.54	9.52	.78	.24	1.28	1.66	.37	2.99	3.24	1.01	8.16	2.23	.72	6.38
05	14.29	5.02	9.38	.00	.00	.00	4.50	1.28	3.57	6.20	2.38	7.22	5.62	2.26	5.79
06	6.69	2.85	3.77	.00	.00	.00	.00	.00	.00	1.05	.57	.94	1.99	1.10	2.00
07	4.23	2.37	13.25	.92	.53	2.67	1.86	.99	5.88	1.18	.74	6.93	1.98	1.27	12.63
08	1.78	.65	9.09	.00	.00	.00	4.03	1.31	11.11	.00	.00	.00	.00	.00	.00
09	9.92	2.15	13.16	3.47	1.47	6.90	1.53	.52	3.51	3.13	1.38	10.20	3.42	1.55	11.76
10	4.23	3.75	9.20	2.03	1.80	4.24	1.26	1.20	3.10	3.02	3.10	9.43	1.85	2.01	5.77
11	7.16	1.52	9.66	1.48	.30	1.80	2.58	.47	2.84	4.56	.98	8.73	6.50	1.43	11.02
12	5.51	5.11	11.94	.71	.69	2.17	.39	.40	1.08	2.18	2.25	9.23	3.32	3.57	10.23
13	2.94	1.32	8.00	.70	.31	2.15	1.14	.46	3.01	1.91	.85	8.07	1.83	.85	6.84
14	.66	.45	2.56	1.35	1.04	4.35	.00	.00	.00	1.33	1.28	10.00	.00	.00	.00
15	.48	.26	1.06	.48	.27	1.10	.48	.27	.88	.00	.00	.00	1.85	1.11	5.80

GROUP	1969 POP	1969 EXP	1969 ACC	1970 POP	1970 EXP	1970 ACC	1971 POP	1971 EXP	1971 ACC	1972 POP	1972 EXP	1972 ACC	ALL YEARS POP	ALL YEARS EXP	ALL YEARS ACC
01	1.76	.59	6.45	3.52	1.14	13.79	1.65	.66	6.90	2.59	1.01	13.64	2.30	.81	7.72
02	5.98	14.22	21.28	7.28	20.60	34.29	3.42	9.64	30.00	1.15	3.64	15.38	6.32	13.76	23.89
03	4.67	5.71	18.97	5.67	7.39	20.45	6.13	8.76	20.95	4.27	6.52	17.60	6.29	[illegible]	18.36
04	1.26	.46	4.65	1.94	.78	5.66	2.63	1.11	12.90	4.17	1.60	11.54	2.50	[illegible]	6.42
05	.69	.32	1.39	3.30	1.85	7.58	2.48	1.62	5.00	3.62	2.54	9.52	3.82	[illegible]	5.38
06	.00	.00	.00	.91	.54	1.23	.85	.56	1.49	.00	.00	.00	1.05	[illegible]	1.06
07	1.40	.89	12.68	1.84	1.23	16.90	2.17	1.56	20.55	2.32	1.64	31.37	1.97	[illegible]	10.96
08	.00	.00	.00	4.83	2.33	28.57	.00	.00	.00	2.44	1.25	25.00	1.40	[illegible]	7.14
09	3.12	1.30	11.76	2.03	.85	6.67	1.44	.67	7.32	3.86	1.79	15.09	2.99	[illegible]	9.39
10	2.40	3.56	7.62	2.43	3.86	8.60	.86	1.44	4.23	3.32	5.86	13.58	2.39	2.80	7.08
11	4.32	1.41	9.28	4.43	1.57	10.34	4.07	1.65	10.62	5.10	2.12	15.40	4.56	[illegible]	9.19
12	1.41	1.55	5.80	2.12	2.71	9.52	1.02	1.41	4.48	3.14	4.18	14.06	2.22	2.46	7.62
13	1.70	1.02	8.37	1.40	.88	7.17	1.34	.91	6.39	1.64	1.10	8.40	1.59	[illegible]	6.38
14	2.02	2.00	10.00	.68	.79	6.25	.62	.78	5.00	.62	.80	10.00	.82	.79	4.62
15	2.16	1.26	5.32	.43	.27	1.02	3.72	2.70	9.78	.42	.28	1.41	1.15	[illegible]	2.86

FIGURE 2. NINE-YEAR SUMMARY OF STALL/SPIN ACCIDENT RATE BY GROUP (SHEET 1 OF 3)

NINE YEAR SUMMARY OF STALL/SPIN ACCIDENT RATES
ACC = PERCENTAGE OF ALL ACCIDENTS THAT WERE STALL/SPIN ACCIDENTS
EXP = NUMBER OF STALL/SPIN ACCIDENTS PER 100,000 FLIGHT HOURS
POP = NUMBER OF STALL/SPIN ACCIDENTS PER 1000 AIRCRAFT

GROUP	1964 POP	1964 EXP	1964 ACC	1965 POP	1965 EXP	1965 ACC	1966 POP	1966 EXP	1966 ACC
16	.86	.47	2.20	.39	.23	.98	.54	.29	1.42
17	12.93	.00	15.79	.00	.00	.00	.00	.00	.00
18	1.87	.89	3.53	.63	.33	.89	.87	.37	1.24
19	.00	.00	.00	.00	.00	.00	.00	.00	.00
20	1.45	.57	3.08	1.29	.54	2.41	.00	.00	.00
21	.00	.00	.00	.00	.00	.00	5.81	1.90	11.11
22	10.12	16.01	14.63	.00	.00	.00	7.34	11.26	9.30
23	2.94	4.45	9.23	.00	.00	.00	1.06	1.25	2.60
24	8.93	11.61	17.12	4.35	6.04	8.49	4.30	6.12	7.62
25	3.76	1.63	4.32	.00	.00	.00	2.76	1.27	4.05
26	1.62	1.40	2.47	1.66	1.48	4.00	1.64	1.59	4.26
27	9.33	9.94	19.87	4.76	4.94	10.56	6.73	7.18	12.84
28	15.89	8.44	24.24	11.45	6.54	17.50	8.25	4.56	15.83
29	3.99	2.24	7.41	.86	.50	1.61	1.16	.70	2.45
30	1.83	.76	4.76	1.26	.54	2.94	1.58	.55	4.04

GROUP	1967 POP	1967 EXP	1967 ACC	1968 POP	1968 EXP	1968 ACC	1969 POP	1969 EXP	1969 ACC
16	.93	.55	3.43	.89	.53	3.02	.52	.33	2.13
17	.00	.00	.00	.00	.00	.00	2.33	.85	5.00
18	.00	.00	.00	.00	.00	.00	.85	.44	3.26
19	.00	.00	.00	10.48	3.83	7.41	8.49	4.88	7.63
20	1.63	.74	4.62	.52	.24	1.69	2.31	1.03	6.25
21	3.17	1.49	12.50	8.55	5.06	4.17	1.09	.49	3.85
22	5.38	7.91	10.71	5.52	8.01	16.67	2.81	5.05	8.70
23	1.87	1.50	6.67	1.91	2.15	6.78	1.54	2.51	8.51
24	3.08	4.21	11.11	5.25	7.20	13.89	3.83	7.39	11.11
25	4.15	2.05	9.03	2.93	1.50	7.75	1.93	1.22	7.34
26	1.68	1.73	4.55	1.69	1.66	5.88	.76	.88	4.17
27	9.16	10.09	30.59	13.26	14.69	32.17	4.85	8.25	25.96
28	9.22	5.21	22.22	9.59	5.71	20.54	11.52	7.68	26.27
29	2.41	1.73	7.98	.77	.59	2.17	1.23	1.33	5.19
30	1.44	.61	5.41	.70	.29	2.90	1.88	.77	7.41

GROUP	1970 POP	1970 EXP	1970 ACC	1971 POP	1971 EXP	1971 ACC	1972 POP	1972 EXP	1972 ACC	ALL YEARS POP	ALL YEARS EXP	ALL YEARS ACC
16	.90	.60	3.50	.85	.61	4.19	.62	.43	3.18	.73	.4	2.61
17	.00	.00	.00	.00	.00	.00	1.87	.73	5.88	1.44	1.04	2.79
18	.84	.46	3.03	1.57	.92	7.06	1.07	.64	3.57	.85	.4	2.29
19	6.95	4.44	9.76	5.64	3.75	11.29	3.10	2.20	7.55	6.25	3.68	8.51
20	.92	.43	3.03	2.98	1.49	12.28	1.64	.79	6.25	1.50	.6[illegible]	4.13
21	1.10	.53	4.55	4.04	2.17	11.76	.00	.00	.00	2.20	1.06	6.36
22	5.69	11.35	16.00	8.24	14.73	25.00	2.83	5.95	14.29	5.29	8.[illegible]6	11.32
23	1.16	2.40	7.69	1.46	3.07	11.43	.37	.79	2.86	1.36	1.[illegible]8	5.83
24	3.45	7.32	9.52	2.80	6.41	11.67	3.23	7.24	12.31	4.30	7.1[illegible]	11.38
25	.96	.64	4.40	1.35	.99	6.32	1.62	1.20	9.09	2.07	1.[illegible]	5.48
26	1.53	1.82	7.69	2.18	2.89	12.50	.00	.00	.00	1.41	1.[illegible]0	4.65
27	4.18	7.95	27.71	4.45	9.67	28.89	2.94	6.36	25.00	5.87	8.6[illegible]	22.30
28	9.94	6.71	22.88	10.35	8.31	34.48	4.23	3.13	12.63	10.00	6.[illegible]	21.60
29	1.24	1.64	5.47	.67	.90	3.10	1.72	2.38	10.87	1.58	1.[illegible]0	4.68
30	1.25	.52	5.56	1.76	.85	9.23	1.20	.56	6.90	1.43	.61	5.26

FIGURE 2. NINE-YEAR SUMMARY OF STALL/SPIN ACCIDENT RATE BY GROUP (SHEET 2 OF 3)

NINE YEAR SUMMARY OF STALL/SPIN ACCIDENT RATES
ACC = PERCENTAGE OF ALL ACCIDENTS THAT WERE STALL/SPIN ACCIDENTS
EXP = NUMBER OF STALL/SPIN ACCIDENTS PER 100,000 FLIGHT HOURS
POP = NUMBER OF STALL/SPIN ACCIDENTS PER 1000 AIRCRAFT

GROUP	1964 POP	1964 EXP	1964 ACC	1965 POP	1965 EXP	1965 ACC	1966 POP	1966 EXP	1966 ACC	1967 POP	1967 EXP	1967 ACC	1968 POP	1968 EXP	1968 ACC
31	2.14	1.08	2.79	.66	.36	.95	1.01	.52	1.28	.90	.52	1.86	.90	.53	2.22
32	5.71	2.19	5.81	.99	.34	1.05	1.82	.46	2.05	2.34	.72	4.44	1.57	.50	3.30
33	13.44	5.19	11.90	6.45	2.53	9.30	5.81	2.00	8.33	6.36	2.70	15.22	5.19	2.10	15.00
34	3.33	4.41	8.54	.50	.75	1.41	2.23	3.43	5.48	3.13	4.82	15.00	3.21	5.09	11.54
35	16.09	23.39	42.19	5.70	8.45	15.00	4.20	6.14	16.22	6.59	9.01	35.71	8.56	11.81	31.82
36	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	25.00
TOT	5.14	2.89	10.06	1.90	1.05	3.73	2.28	1.04	4.25	3.01	1.51	8.56	3.22	1.62	8.60

GROUP	1969 POP	1969 EXP	1969 ACC	1970 POP	1970 EXP	1970 ACC	1971 POP	1971 EXP	1971 ACC	1972 POP	1972 EXP	1972 ACC	ALL YEARS POP	ALL YEARS EXP	ALL YEARS ACC
31	1.48	.94	3.97	1.19	.77	3.54	1.39	.99	4.00	1.42	1.03	[illegible].85	1.23	.74	2.53
32	1.67	.73	4.40	1.70	.81	4.63	1,53	.81	4.68	1.44	.76	5.11	1,74	.71	3.91
33	3.70	1.61	10.00	4.39	2.02	13.64	4.12	2.09	13.04	2.13	1.07	6.00	4.85	2.11	11.16
34	1.71	3.54	7.84	1.30	3.13	7.14	.81	1.98	4.08	.82	2.00	4.76	1.82	3.30	6.97
35	4.45	10.06	25.58	5.35	15.46	31.71	5.46	15.28	32.56	3.16	8.30	24.24	6.28	12.04	28.50
36	11.24	14.53	27.27	17.80	15.30	20.00	8.58	5.98	13.89	14.53	8.13	20.75	13.37	9.[illegible]	19.40
TOT	2.57	1.58	8.63	2.58	1.69	9.14	2.53	1.83	10.02	2.33	1.66	10.08	2.77	1.62	7.93

FIGURE 2. NINE-YEAR SUMMARY OF STALL/SPIN ACCIDENT RATE BY GROUP (SHEET 3 OF 3)

NINE-YEAR SUMMARY

Accident Rate*		Exposure Rate**		Population Rate***	
Group	Rate	Group	Rate	Group	Rate
35	28.50	35	28.50	36	13.37
2	23.89	2	13.76	28	10.00
27	22.30	36	9.32	2	6.32
28	21.60	22	8.96	3	6.29
36	19.40	27	8.69	35	6.28
3	18.36	24	7.15	19	6.25
24	11.38	3	6.50	27	5.87
22	11.32	28	6.28	22	5.29
33	11.16	19	3.68	33	4.85
7	10.96	34	3.30	11	4.56
9	9.39	10	2.80	24	4.30
11	9.19	12	2.46	5	3.82
19	8.51	33	2.11	9	2.99
1	7.72	23	1.98	4	2.50
12	7.62	5	1.77	10	2.39
8	7.14	26	1.50	1	2.30
10	7.08	11	1.32	12	2.22
34	6.97	29	1.30	21	2.20
4	6.42	7	1.24	25	2.07
13	6.38	9	1.24	7	1.97
21	6.36	25	1.20	34	1.82
23	5.83	21	1.06	32	1.74
25	5.48	17	1.04	13	1.59
5	5.38	13	0.85	29	1.58
30	5.26	4	0.83	20	1.50
29	4.68	1	0.81	17	1.44
26	4.65	14	0.79	30	1.43
14	4.62	31	0.74	26	1.41
20	4.13	32	0.71	8	1.40
32	3.91	15	0.70	23	1.36
15	2.86	20	0.67	15	1.15
17	2.79	30	0.61	6	1.05
16	2.61	8	0.58	18	0.85
31	2.53	6	0.57	14	0.82
18	2.29	18	0.45	31	0.74
6	1.06	16	0.45	16	0.73

*Percentage of all accidents that were stall/spin accidents.
**Rate of stall/spin accidents per 100,000 flight hours.
***Rate of stall/spin accidents per 1,000 aircrafts.

FIGURE 3. TABULATION OF STALL/SPIN ACCIDENT RATE

PILOT EXPERIENCE CATEGORIZATION

	TOTAL TIME						TIME IN TYPE						TIME LAST 90 DAYS					PAGE 1
GROUP	TTA	TTB	TTC	TTD	TTE	TTZ	TITA	TITB	TITC	TITD	TITE	TITZ	T90A	T90B	T90C	T90D	T90E	T90Z
01			1	5	15	1	3	1	3	4	8	3	1	3	5	1	4	8
02	22	23	9	8	3	5	22	18	9	6	3	12	4	17	15	8	3	23
03	50	55	34	49	28	10	58	60	37	18	21	32	13	47	47	18	18	83
04			2	3	25	1	1	6	3		16	5			1	7	11	12
05	8	12	1	11	6	2	16	10	4	2	4	4	2	4	9	9	6	10
06	1		3		5		2		1	2	2	2		2	1		3	3
07	8	21	9	42	24	4	12	23	11	13	29	20	3	13	28	8	3	53
08				1	5		1	2		2		1			2			4
09		1		14	27	1	7	4	11	6	9	6	1	2	9	7	5	19
10	17	23	12	12	6	2	20	14	15	11	9	3	7	20	12	5	3	25
11	158	58	20	38	41	7	80	101	43	26	43	29	42	88	72	29	46	45
12	13	20	5	10	6	2	16	16	7	5	5	7	4	12	3	7	5	25
13	34	47	18	23	16	3	48	25	19	24	15	10	12	31	38	17	8	35
14	1	5	1	3	1		2	4	1	2	2		1	5	3			2
15		5	4	2	12		1	1	7	5	5	4		3	4	5	6	5
16	3	11	7	14	8	1	10	7	8	3	10	6	4	6	17	6	1	10
17				1	4					2	2	1		1				4
18	3	1	3	8	7		3	3	4	5	2	5	2	1	3	3	2	11
19	13	9	2	6	5	1	19	11	2	1	1	2	4	11	10	4	5	2
20			3	6	16	1	2	2	3	4	10	5		1	6	4	5	10
21				6	5		2	2	1	3	2	1		1	4	1	1	4
22		7	4	9	9	1	7	7	6	4	2	4		4	8	2	1	15
23	6	7	5	5	5		13	4	4	3	3	1	1	6	8	1	2	10

FIGURE 4. STALL/SPIN ACCIDENTS BY PILOT EXPERIENCE (SHEET 1 OF 2)

PILOT EXPERIENCE CATEGORIZATION

	TOTAL TIME						TIME IN TYPE						TIME LAST 90 DAYS					
GROUP	TTA	TTB	TTC	TTD	TTE	TTZ	TITA	TITB	TITC	TITD	TITE	TITZ	T90A	T90B	T90C	T90D	T90E	T90Z
24	16	25	12	21	6	4	29	26	12	3	5	9	9	17	13	8	6	31
25	8	15	9	16	10	5	12	15	6	12	11	7	1	10	21	8	5	18
26	1	2	2	7	3	1		4	2	5	3	2		2	5	2	2	5
27	42	50	36	47	35	11	54	56	30	27	33	21	0	38	57	20	25	73
28	17	33	20	67	88	7	37	38	27	32	65	33	5	25	43	32	45	82
29	18	24	9	10	13	6	21	12	13	8	13	13	2	17	14	11	5	31
30			3	11	21	2	2	7	6	9	7	6	1	5	5	8	7	11
31	1	12	6	12	3	2	5	9	5	8	2	7	2	3	6	4	2	19
32	33	36	13	17	25	1	31	42	20	13	17	2	5	30	35	13	21	21
33		1	3	17	25	1	7	13	9	7	8	3	1	4	9	2	20	11
34	4	13	6	6	5	1	10	9	3	3	6	4	2	7	5	5	1	15
35	42	39	15	6	7	3	29	33	15	12	6	17	3	30	26	8	5	40
36	6	7	4	4	5		13	4	5		3	1	3	7	4	2	5	5
GRAND TOTAL	525	562	281	517	525	86	595	589	352	290	382	288	143	473	548	265	287	780

Hours	Hours	Hours
TTA = 0-100	TITA = 0-25	T90A = 0-5
TTB = 101-300	TITB = 26-75	T90B = 6-20
TTC = 301-500	TITC = 76-150	T90C = 21-50
TTD = 501-1,500	TITD = 151-300	T90D = 51-100
TTE = Over 1,500	TITG = Over 300	T90E = Over 100
TTZ = Unknown	TITZ = Unknown	T90F = Unknown

FIGURE 4. STALL/SPIN ACCIDENTS BY PILOT EXPERIENCE (SHEET 2 OF 2)

KIND OF FLYING CATEGORIZATION

PAGE 1

GROUP	INSTRUCTION/ TRAINING	POINT TO POINT TRANSPORTATION	LOW ALTITUDE	PLEASURE/ SOLO	AERIAL APPLICATION	OTHER	NOT CODED	ALL KINDS
01	5	7		10				22
02	14	3	4	48		1		70
03	30	10	17	157	4	8		226
04		21		7	2	1		31
05	11	5		21		3		40
06	1	4		3		1		9
07	6	21		80		1		108
08		5		1				6
09	12	10		19		2		43
10	9	4	1	54.		4		72
11	168	9	6	136		3		322
12	9	8	1	37		1		56
13	18	17	1	100		5		141
14	1	2		8				11
15		11	2	9	1			23
16	1	17		25		1		44
17		3		1			1	5
18		10	1	11				22
19	5	5	1	24		1		36
20	5	8	1	11		1		26
21	2	3	1	4		1		11
22	3	3		24				30
23	6	1		21				28

FIGURE 5. STALL/SPIN ACCIDENTS BY KIND OF FLYING (SHEET 1 OF 2)

KIND OF FLYING CATEGORIZATION

GROUP	INSTRUCTION/ TRAINING	POINT TO POINT TRANSPORTATION	LOW ALTITUDE	PLEASURE/ SOLO	AERIAL APPLICATION	OTHER	NOT CODED	ALL KINDS
24	15	6	1	60		2		84
25	10	15	1	37				63
26		1	1	13		1		16
27	30	23	20	122	15	11		221
28	13	47	28	58	79	7		232
29	16	12		52				80
30	6	10	2	19				37
31	2	6		28				36
32	42	12		67	1	3		125
33	20	13		13		1		47
34	3	6	1	23	1	1		35
35	17	8	5	79		3		112
36	13	1		10		2		26
GRAND TOTAL	493	347	95	1392	103	65	1	2496

FIGURE 5. STALL/SPIN ACCIDENTS BY KIND OF FLYING (SHEET 2 OF 2)

OPERATIONAL PHASE OF FLIGHT CATEGORIZATION

PAGE 1

GROUP	TAKE OFF	CLIMB/ DESCENT	NORMAL ENROUTE	APPROACH/ LANDING	TURNING FLIGHT	LOW ALT ENROUTE	OTHER	ALL PHASES
01	5	1	6	4	1	1	4	22
02	29	3	6	9	4	5	14	70
03	68	3	12	15	18	45	65	226
04	22			7		2		31
05	21		4	6	2	2	5	40
06	3			2	2		2	9
07	46	3	14	16	14	5	10	108
08	2			3	1			6
09	14		10	5	1	1	12	43
10	36	1	2	8	3	10	12	72
11	106	8	30	42	12	42	82	322
12	31	3	4	10		3	5	56
13	72	3	13	28	2	7	16	141
14	4		2	2	1	1	1	11
15	14			4	1	2	2	23
16	13	2	5	9	1	5	9	44
17	3	1	1					5
18	6	1	2	3	2		8	22
19	22		1	5	1	2	5	36
20	11	3	1	5	2		4	26
21	3		2	3		1	2	11
22	11	1	6	3	2	2	5	30
23	11	1	3	8	1	1	3	28

FIGURE 6. STALL/SPIN ACCIDENTS BY OPERATIONAL PHASE OF FLYING (SHEET 1 OF 2)

OPERATIONAL PHASE OF FLIGHT CATEGORIZATION

PAGE 2

GROUP	TAKE OFF	CLIMB/ DESCENT	NORMAL ENROUTE	APPROACH/ LANDING	TURNING FLIGHT	LOW ALT ENROUTE	OTHER	ALL PHASES
24	39	5	4	10	4	6	16	84
25	21	5	12	7	4	2	12	63
26	9	1		3	1		2	16
27	83	5	13	19	23	28	50	221
28	49	13	6	19	54	53	38	232
29	45	2	10	8		6	9	80
30	15	4	9	5	1		3	37
31	21	1	3	4	1		6	36
32	41	4	20	26	8	5	21	125
33	18	3	11	6	2		7	47
34	17	1	6	5	2	2	2	35
35	32	7	11	8	7	17	30	112
36	4	2		3	3		14	26
GRAND TOTAL	947	87	229	320	181	256	476	2496

FIGURE 6. STALL/SPIN ACCIDENTS BY OPERATIONAL PHASE OF FLYING (SHEET 2 OF 2)

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY GROUP FOR ALL 5 YEARS
RUN DATE 3/27/75

A/C Group	RATING ORDER	STALL/SPIN ACC OCCURENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURENCES	CHI SQUARE	TOTAL
1	14	22.	-.12340	263.	.02	285.
	5	70.	4.70780	223.	42.24	293.
	4	226.	13.00403	1005.	169.10	1231.
	20	31.	-1.17636	452.	1.39	483.
	25	40.	-2.46083	703.	5.06	743.
	33	9.	-7.11641	842.	50.64	851.
	7	108.	3.38848	877.	11.48	985.
	15	6.	-.25466	78.	.06	84.
	12	43.	1.11262	415.	1.24	458.
	19	72.	-.95771	945.	.92	1017.
	9	322.	2.66901	3180.	7.12	3502.
	16	56.	-.29471	679.	.09	735.
	27	141.	-2.57458	2068.	5.63	2209.
	22	11.	-1.61019	227.	3.25	238.
	31	23.	-5.10771	782.	26.09	805.
	35	44.	-7.73912	1639.	54.89	1683.
	24	5.	-2.43889	174.	5.95	179.
	32	22.	-6.20604	939.	38.51	961.
	13	36.	.42781	387.	.18	423.
	29	26.	-3.38636	604.	11.47	630.
	17	11.	-.73199	162.	.54	173.
	11	30.	1.96358	235.	3.85	265.
	21	28.	-1.62789	452.	2.65	480.
	8	84.	3.33604	654.	11.13	738.
	28	63.	-2.94745	1087.	8.69	1150.
	23	16.	-2.15697	328.	4.65	344.
	1	221.	16.07543	770.	258.42	991.
	2	232.	15.92110	842.	253.48	1074.
	30	80.	-4.76913	1630.	22.74	1710.
	26	37.	-2.51592	667.	6.33	704.
	34	36.	-7.22951	1387.	52.27	1423.
	36	125.	-8.06811	3073.	65.09	3198.
	10	47.	2.36063	374.	5.57	421.
	18	35.	-.75844	467.	.58	502.
	3	112.	14.48793	281.	209.90	393.
36	6	26.	4.71970	108.	22.28	134.
TOTAL		2496.		28999.	1420.54	31495.

NO ROWS = 36 NO COLUMNS = 2 DEGREES OF FREEDOM = 35

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	35	40.20785	46.03055	49.76575	53.16045	57.29145	60.21900	66.55250

FIGURE 7. CHI-SQUARE ANALYSIS - ACCIDENT BASE - ALL GROUPS

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY NO OF ENGINES/WING POSITION/HORSEPOWER
RUN DATE 3/10/75

ROW TITLE	RATING ORDER	STALL/SPIN ACC OCCURENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
SINGLE ENG H/W HP-A	1	1339.	22.42507	7900.	502.88		9239.
SINGLE ENG H/W HP-B	5	359.	-4.75066	5458.	22.57		5817.
SINGLE ENG H/W HP-C	8	94.	-11.41285	3534.	130.25		3628.
SINGLE ENG L/W HP-A	3	28.	-1.62789	452.	2.65		480.
SINGLE ENG L/W HP-B	6	181.	-6.16356	3416.	37.99		3597.
SINGLE ENG L/W HP-C	7	272.	-7.83713	5224.	61.42		5496.
TWIN ENG H/W HP-D	2	33.	-.54722	425.	.30		458.
TWIN ENG L/W HP-D	4	190.	-2.04249	2590.	4.17		2780.
TOTAL		2496.		28999.	762.23		31495.

NO ROWS = 8   NO COLUMNS = 2   DEGREES OF FREEDOM = 7

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	7	9.03715	12.01700	14.06710	16.01280	18.47530	20.27770	24.32200

FIGURE 8. CHI-SQUARE ANALYSIS - ACCIDENT BASE - ENGINE/WING POSITION/HORSEPOWER

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY A

ROW TITLE	RATING ORDER	STALL/SPIN ACC OCCURENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
GROUP 2	4	70.	4.22557	223.	17.86		293.
GROUP 3	5	226.	3.56311	1005.	12.70		1231.
GROUP 10	7	72.	-6.21001	945.	38.57		1017.
GROUP 11	8	322.	-8.23580	3180.	67.83		3502.
GROUP 24	6	84.	-2.21984	654.	4.93		738.
GROUP 27	2	221.	6.45636	770.	41.68		991.
GROUP 28	3	232.	6.11938	842.	37.45		1074.
GROUP 35	1	112.	7.29335	281.	53.19		393.
TOTAL		1339.		7900.	274.21		9239.

NO ROWS = 8 NO COLUMNS = 2 DEGREES OF FREEDOM = 7

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	7	9.03715	12.01700	14.06710	16.01280	18.47530	20.27770	24.32200

FIGURE 9. CHI-SQUARE ANALYSIS - ACCIDENT BASE - SE/HW/HP CAT. A

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY B

ROW TITLE	RATING ORDER	STALL/SPIN ACC OCCURENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
GROUP 12	2	56.	1.57464	679.	2.50		735.
GROUP 13	4	141.	.39997	2068.	.16		2209.
GROUP 14	5	11.	-.96237	227.	.93		238.
GROUP 19	1	36.	1.93649	387.	3.75		423.
GROUP 29	6	80.	-2.48553	1630.	6.18		1710.
GROUP 34	3	35.	.72200	467.	.52		502.
TOTAL		359.		5458.	14.04		5817.

NO ROWS = 6 NO COLUMNS = 2 DEGREES OF FREEDOM = 5

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	5	6.62568	9.23636	11.07050	12.83250	15.08630	16.74960	20.51500

FIGURE 10. CHI-SQUARE ANALYSIS - ACCIDENT BASE - SE/HW/HP CAT. B

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY C

ROW TITLE	RATING ORDER	STALL/SPIN ACC OCCURENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURENCES	ALL OTHER ACC RATING	CHI SQUARE	TOTAL
GROUP 15	1	23.	.46919	782.		.22	805.
GROUP 16	3	44.	.05969	1639.		.00	1683.
GROUP 17	2	5.	.16818	174.		.03	179.
GROUP 18	4	22.	-.58100	939.		.34	961.
TOTAL		94.		3534.		.59	3628.

NO ROWS = 4 NO COLUMNS = 2 DEGREES OF FREEDOM = 3

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	3	4.10834	6.25139	7.81473	9.34840	11.34490	12.83820	16.26600

FIGURE 11. CHI-SQUARE ANALYSIS - ACCIDENT BASE - SE/HW/HP CAT. C

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE LOW WING HORSEPOWER CATEGORY B

ROW TITLE	RATING ORDER	STALL/SPIN ACC OCCURENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
GROUP 22	2	30.	4.56374	235.	20.83		265.
GROUP 32	3	125.	-2.83177	3073.	8.02		3198.
GROUP 36	1	26.	7.41602	108.	55.00		134.
TOTAL		181.		3416.	83.85		3597.

NO ROWS = 3 NO COLUMNS = 2 DEGREES OF FREEDOM = 2

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	2	2.77259	4.60517	5.99140	7.37776	9.21034	10.59660	13.81600

FIGURE 12. CHI-SQUARE ANALYSIS - ACCIDENT BASE - SF/LW/HP CAT. B

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE LOW WING HORSEPOWER CATEGORY C

ROW TITLE	RATING ORDER	STALL/SPIN ACC OCCURENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURENCES	ALL OTHER ACC RATING	CHI SQUARE	RATING	TOTAL
GROUP 5	3	40.	.53241	703.	-.12149	.28		743.
GROUP 6	6	9.	-5.10291	842.	1.16440	26.04		851.
GROUP 7	1	108.	8.48638	877.	-1.93645	72.02		985.
GROUP 25	2	63.	.80670	1087.	-.18408	.55		1150.
GROUP 26	4	16.	-.24836	328.	.05667	.05		344.
GROUP 31	5	36.	-4.10214	1387.	.93604	16.83		1423.
TOTAL		272.		5224.		115.88		5496.

NO ROWS = 6 NO COLUMNS = 2 DEGREES OF FREEDOM = 5

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	5	6.62568	9.23636	11.07050	12.83250	15.08630	16.74960	20.51500

FIGURE 13. CHI-SQUARE ANALYSIS - ACCIDENT BASE - SE/LW/HP CAT. C

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY GROUP WITHIN RATING CATEGORY
TWIN ENGINE HIGH WING HORSEPOWER CATEGORY D

ROW TITLE	RATING ORDER	STALL/SPIN ACC OCCURRENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURRENCES	CHI SQUARE	RATING	TOTAL
GROUP 1	1	22.	.32330	263.	.10		285.
GROUP 21	2	11.	-.41496	162.	.17		173.
TOTAL		33.		425.	.27		458.

NO ROWS = 2 NO COLUMNS = 2 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 14. CHI-SQUARE ANALYSIS - ACCIDENT BASE - TE/HW/HP CAT. D

CHI SQUARE ANALYSIS
STALL/SPIN VERSUS ALL OTHER ACCIDENTS
BY GROUP WITHIN RATING CATEGORY
TWIN ENGINE LOW WING HORSEPOWER CATEGORY D

ROW TITLE	RATING ORDER	STALL/SPIN ACC OCCURRENCES	STALL/SPIN ACC RATING	ALL OTHER ACC OCCURENCES	ALL OTHER ACC RATING	CHI SQUARE	RATING	TOTAL
GROUP 4	4	31.	-.34999	452.	.09479	.12		483.
GROUP 8	3	6.	.10809	78.	-.02928	.01		84.
GROUP 9	2	43.	2.09083	415.	-.56630	4.37		458.
GROUP 20	6	26.	-2.59951	604.	.70408	6.76		630.
GROUP 30	5	37.	-1.60241	667.	.43401	2.57		704.
GROUP 33	1	47.	3.39790	374.	-.92032	11.55		421.
TOTAL		190.		2590.		25.38		2780.

NO ROWS = 6 NO COLUMNS = 2 DEGREES OF FREEDOM = 5

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	5	6.62568	9.23636	11.07050	12.83250	15.08630	16.74960	20.51500

FIGURE 15. CHI-SQUARE ANALYSIS - ACCIDENT BASE - TE/LW/HP CAT. D

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
NINE YEAR SUMMARY

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURENCES	S/S ACCIDENTS RATING	POP NOT IN S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	16	22.	-.87388	9560.	.76	9582.
GROUP 2	7	70.	7.10790	11013.	50.52	11083.
GROUP 3	2	226.	12.70619	35700.	161.45	35926.
GROUP 4	14	31.	-.56117	12367.	.31	12398.
GROUP 5	12	40.	2.04423	10444.	4.18	10484.
GROUP 6	24	9.	-3.02697	8580.	9.15	8589.
GROUP 7	26	108.	-3.52982	54653.	12.46	54761.
GROUP 8	20	6.	-1.70120	4282.	2.89	4288.
GROUP 9	13	43.	.51633	14329.	.27	14372.
GROUP 10	17	72.	-1.24605	30078.	1.55	30150.
GROUP 11	4	322.	9.06169	70317.	82.11	70639.
GROUP 12	19	56.	-1.65621	25199.	2.74	25255.
GROUP 13	35	141.	-6.64131	88431.	44.11	88572.
GROUP 14	29	11.	-4.28956	13420.	18.40	13431.
GROUP 15	30	23.	-4.35065	20001.	18.93	20024.
GROUP 16	36	44.	-9.51501	60322.	90.54	60366.
GROUP 17	18	5.	-1.48910	3473.	2.22	3478.
GROUP 18	34	22.	-5.86940	25905.	34.45	25927.
GROUP 19	8	36.	5.03008	5723.	25.30	5759.
GROUP 20	25	26.	-3.18523	17363.	10.15	17389.
GROUP 21	15	11.	-.76231	4992.	.58	5003.
GROUP 22	11	30.	3.61634	5640.	13.08	5670.
GROUP 23	27	28.	-3.83989	20579.	14.74	20607.
GROUP 24	9	84.	4.07179	19465.	16.58	19549.
GROUP 25	21	63.	-2.31714	30410.	5.37	30473.
GROUP 26	23	16.	-2.75887	11367.	7.61	11383.
GROUP 27	3	221.	11.46055	37415.	131.34	37636.
GROUP 28	1	232.	20.96313	22957.	439.46	23189.
GROUP 29	32	80.	-5.09790	50692.	25.99	50772.
GROUP 30	28	37.	-4.08431	25835.	16.68	25872.
GROUP 31	31	36.	-5.00441	29274.	25.04	29310.
GROUP 32	33	125.	-5.24002	71799.	27.46	71924.
GROUP 33	10	47.	3.90201	9644.	15.23	9691.
GROUP 34	22	35.	-2.49480	19201.	6.22	19236.
GROUP 35	5	112.	8.92289	17726.	79.52	17838.
GROUP 36	6	26.	8.89493	1918.	79.12	1944.
TOTAL		2496.		900074.	1476.62	902570.

NO ROWS = 36 NO COLUMNS = 2 DEGREES OF FREEDOM = 35

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	35	40.20785	46.03055	49.76575	53.16045	57.29145	60.21900	66.55250

FIGURE 16. CHI-SQUARE ANALYSIS - POPULATION BASE - ALL GROUPS

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
BY NO OF ENGINES/WING POSITION/HORSEPOWER
NINE YEAR SUMMARY

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURENCES	S/S ACCIDENTS RATING	POP NOT IN S/S ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
SINGLE ENG H/W HP-A	1	1339.	25.25304	244671.	637.72		246010.
SINGLE ENG H/W HP-B	7	359.	-8.54409	202666.	73.00		203025.
SINGLE ENG H/W HP-C	8	94.	-12.03046	109701.	144.73		109795.
SINGLE ENG L/W HP-A	5	28.	-3.83989	20579.	14.74		20607.
SINGLE ENG L/W HP-B	3	181.	-2.62691	79358.	6.90		79539.
SINGLE ENG L/W HP-C	6	272.	-6.44144	144728.	41.49		145000.
TWIN ENG H/W HP-D	2	33.	-1.15477	14552.	1.33		14585.
TWIN ENG L/W HP-D	4	190.	-2.77677	83820.	7.71		84010.
TOTAL		2496.		900075.	927.62		902571.

NO ROWS = 8 NO COLUMNS = 2 DEGREES OF FREEDOM = 7

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	7	9.03715	12.01700	14.06710	16.01280	18.47530	20.27770	24.32200

FIGURE 17. CHI-SQUARE ANALYSIS - POPULATION BASE - ENGINE/WING

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY A

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURRENCES	S/S ACCIDENTS RATING	POP NOT IN S/S ACC OCCURRENCES	CHI SQUARE	RATING	TOTAL
GROUP 2	4	70.	1.24590	11013.	1.55		11083.
GROUP 3	2	226.	2.17823	35700.	4.74		35926.
GROUP 10	8	72.	-7.18475	30078.	51.57		30150.
GROUP 11	7	322.	-3.18637	70317.	10.15		70639.
GROUP 24	6	84.	-2.17181	19465.	4.72		19549.
GROUP 27	5	221.	1.12454	37415.	1.27		37636.
GROUP 28	1	232.	4.41604	22957.	88.55		23189.
GROUP 35	3	112.	1.51319	17726.	6.24		17838.
TOTAL		1339.		244671.	165.07		246010.

NO ROWS = 8 NO COLUMNS = 2 DEGREES OF FREEDOM = 7

PROBABILITY	0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM 1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM 7	9.03715	12.01700	14.06710	16.01280	18.47530	20.27770	24.32200

FIGURE 18. CHI-SQUARE ANALYSIS - POPULATION BASE - SE/HW/HP CAT. A

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY B

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURRENCES	S/S ACCIDENTS RATING	POP NOT IN S/S ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
GROUP 12	2	56.	1.69735	25199.	2.88		25255.
GROUP 13	5	141.	-1.24796	88431.	1.56		88572.
GROUP 14	6	11.	-2.61616	13420.	6.84		13431.
GROUP 19	1	36.	8.09009	5723.	65.45		5759.
GROUP 29	4	80.	-1.03195	50692.	1.06		50772.
GROUP 34	3	35.	.16904	19201.	.03		19236.
TOTAL		359.		202666.	77.82		203025.

NO ROWS = 6 NO COLUMNS = 2 DEGREES OF FREEDOM = 5

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	5	6.62568	9.23636	11.07050	12.83250	15.08630	16.74960	20.51500

FIGURE 19. CHI-SQUARE ANALYSIS - POPULATION BASE - SE/HW/HP CAT. B

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY C

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURENCES	S/S ACCIDENTS RATING	POP NOT IN S/S ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
GROUP 15	1	23.	1.41449	20001.	2.00		20024.
GROUP 16	4	44.	-1.06855	60322.	1.14		60366.
GROUP 17	2	5.	1.17197	3473.	1.37		3478.
GROUP 18	3	22.	-.04185	25905.	.00		25927.
TOTAL		94.		109701.	4.51		109795.

NO ROWS = 4 NO COLUMNS = 2 DEGREES OF FREEDOM = 3

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	3	4.10834	6.25139	7.81473	9.34840	11.34490	12.83820	16.26600

FIGURE 20. CHI-SQUARE ANALYSIS - POPULATION BASE - SE/HW/HP CAT. C

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE LOW WING HORSEPOWER CATEGORY B

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURRENCES	S/S ACCIDENTS RATING	FOR NOT IN S/S ACC OCCURRENCES	CHI SQUARE	RATING	TOTAL
GROUP 22	2	30.	4.75970	5640.	22.55		5670.
GROUP 32	3	125.	-3.02289	71799.	9.14		71924.
GROUP 36	1	26.	10.25827	1918.	105.23		1944.
TOTAL		181.		79357.	137.02		79538.

NO ROWS = 3 NO COLUMNS = 2 DEGREES OF FREEDOM = 2

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	2	2.77259	4.60517	5.99140	7.37776	9.21034	10.59660	13.81600

FIGURE 21. CHI-SQUARE ANALYSIS - POPULATION BASE - SE/LW/HP CAT. B

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE LOW WING HORSEPOWER CATEGORY C

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURRENCES	S/S ACCIDENTS RATING	POP NOT IN S/S ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
GROUP 5	1	40.	4.58508	10444.	21.02		10484.
GROUP 6	5	9.	-1.77177	8580.	3.14		8589.
GROUP 7	3	108.	.52055	54653.	.27		54761.
GROUP 25	2	63.	.77201	30410.	.60		30473.
GROUP 26	4	16.	-1.15841	11367.	1.34		11383.
GROUP 31	6	36.	-2.55490	29274.	6.55		29310.
TOTAL		272.		144728.	32.92		145000.

NO ROWS = 6 NO COLUMNS = 2 DEGREES OF FREEDOM = 5

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	5	6.62568	9.23636	11.07050	12.83250	15.08630	16.74960	20.51500

FIGURE 22. CHI-SQUARE ANALYSIS - POPULATION BASE - SE/LW/HP CAT. C

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
BY GROUP WITHIN RATING CATEGORY
TWIN ENGINE HIGH WING HORSEPOWER CATEGORY D

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURENCES	S/S ACCIDENTS RATING	POP NOT IN S/S ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
GROUP 1	1	22.	.06668	9560.	.00		9582.
GROUP 21	2	11.	-.09505	4992.	.01		5003.
TOTAL		33.		14552.	.01		14585.

NO ROWS = 2 NO COLUMNS = 2 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 23. CHI-SQUARE ANALYSIS - POPULATION BASE - TE/HW/HP CAT. D

CHI SQUARE ANALYSIS
STALL/ SPIN ACCIDENTS VERSUS POPULATION
BY GROUP WITHIN RATING CATEGORY
TWIN ENGINE LOW WING HORSEPOWER CATEGORY D

ROW TITLE	RATING ORDER	S/S ACCIDENTS OCCURENCES	S/S ACCIDENTS RATING	POP NOT IN S/S ACC OCCURENCES	CHI SQUARE	RATING	TOTAL
GROUP 4	3	31.	.55904	12367.	.31		12398.
GROUP 8	4	6.	-1.18745	4282.	1.41		4288.
GROUP 9	2	43.	1.84096	14329.	3.39		14372.
GROUP 20	5	26.	-2.12521	17363.	4.52		17389.
GROUP 30	6	37.	-2.81239	25835.	7.91		25872.
GROUP 33	1	47.	5.35766	9644.	28.70		9691.
TOTAL		190.		83820.	46.24		84010.

NO ROWS = 6 NO COLUMNS = 2 DEGREES OF FREEDOM = 5

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800
DEG OF FDM	5	6.62568	9.23636	11.07050	12.83250	15.08630	16.74960	20.51500

FIGURE 24. CHI-SQUARE ANALYSIS - POPULATION BASE - TE/LW/HP CAT. D

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
NINE YEAR SUMMARY

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	26	22.	-3.35191	44.	11.24	66.
GROUP 2	5	70.	21.47517	8.	461.18	78.
GROUP 3	3	226.	22.54886	57.	508.45	283.
GROUP 4	28	31.	-3.77976	60.	14.29	91.
GROUP 5	15	40.	.55375	37.	.31	77.
GROUP 6	25	9.	-3.29574	26.	10.66	35.
GROUP 7	24	108.	-2.79718	141.	7.82	249.
GROUP 8	23	6.	-2.62563	17.	6.69	23.
GROUP 9	19	43.	-1.77056	56.	3.13	99.
GROUP 10	10	72.	4.67623	42.	21.87	114.
GROUP 11	27	322.	-3.70012	396.	13.69	718.
GROUP 12	12	56.	3.12423	37.	9.76	93.
GROUP 13	34	141.	-7.82897	270.	61.29	411.
GROUP 14	22	11.	-2.44658	23.	5.99	34.
GROUP 15	15	23.	-4.16486	53.	17.35	76.
GROUP 16	35	44.	-9.05092	158.	81.92	202.
GROUP 17	17	5.	-1.00248	8.	1.01	13.
GROUP 18	18	22.	-6.47966	80.	41.99	102.
GROUP 19	9	36.	5.03747	16.	25.38	52.
GROUP 20	30	26.	-4.68496	63.	21.95	89.
GROUP 21	18	11.	-1.43632	17.	2.06	28.
GROUP 22	7	30.	10.53342	5.	110.95	35.
GROUP 23	14	28.	1.05888	23.	1.12	51.
GROUP 24	6	84.	14.84944	19.	220.51	103.
GROUP 25	21	63.	-2.40854	85.	5.60	148.
GROUP 26	16	16.	-.31102	17.	.10	33.
GROUP 27	1	221.	27.95788	41.	781.64	262.
GROUP 28	4	232.	22.19912	60.	492.80	292.
GROUP 29	20	80.	-2.00856	100.	4.03	180.
GROUP 30	32	37.	-6.24363	99.	38.98	136.
GROUP 31	31	36.	-4.86304	79.	23.65	115.
GROUP 32	36	125.	-9.49910	286.	90.23	411.
GROUP 33	13	47.	1.79908	36.	3.24	83.
GROUP 34	11	35.	4.27559	17.	18.28	52.
GROUP 35	2	112.	24.91509	15.	620.76	127.
GROUP 36	8	26.	10.08442	5.	101.70	31.
TOTAL		2496.		2496.	3842.22	4992.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82900

FIGURE 25. CHI-SQUARE ANALYSIS - EXPOSURE BASE - ALL GROUPS

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY NO OF ENGINES/WING POSITION/HORSEPOWER
NINE YEAR SUMMARY

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
SINGLE ENG H/W HP-A	1	1339.	27.77214	638.	771.54	1977.
SINGLE ENG H/W HP-B	4	359.	-4.80926	462.	23.13	821.
SINGLE ENG H/W HP-C	8	94.	-11.84850	299.	140.39	393.
SINGLE ENG L/W HP-A	2	28.	1.05886	23.	1.12	51.
SINGLE ENG L/W HP-B	6	181.	-6.65962	295.	44.35	476.
SINGLE ENG L/W HP-C	5	272.	-5.77815	385.	33.39	657.
TWIN ENG H/W HP-D	3	33.	-3.60657	61.	13.01	94.
TWIN ENG L/W HP-D	7	190.	-7.79396	332.	60.75	522.
TOTAL		2496.		2496.	1087.43	4992.

NO ROWS = 8 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 26. CHI-SQUARE ANALYSIS - EXPOSURE BASE - ENGINE/WING POSITION/HORSEPOWER

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY A

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 2	3	70.	12.63822	17.	159.72	87.
GROUP 3	4	226.	9.65600	119.	97.14	345.
GROUP 10	7	72.	-1.67840	88.	2.81	160.
GROUP 11	8	322.	-17.64843	831.	311.48	1153.
GROUP 24	6	84.	6.93061	40.	48.03	124.
GROUP 27	1	221.	14.41579	87.	207.81	308.
GROUP 26	5	232.	9.43943	126.	89.11	358.
GROUP 35	2	112.	14.24279	32.	202.86	144.
TOTAL		1339.		1339.	1118.96	2678.

NO ROWS = 8 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY	0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM 1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 27. CHI-SQUARE ANALYSIS - EXPOSURE BASE - SE/HW/HP CAT. A

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY B

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 12	3	56.	5.08967	29.	25.90	85.
GROUP 13	6	141.	-4.71823	209.	22.26	350.
GROUP 14	5	11.	-1.56493	18.	2.46	29.
GROUP 19	1	36.	5.72956	12.	45.29	48.
GROUP 29	4	80.	.25986	78.	.07	158.
GROUP 34	2	35.	5.90556	13.	34.49	48.
TOTAL		359.		359.	130.67	718.

NO ROWS = 6 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 28. CHI-SQUARE ANALYSIS - EXPOSURE BASE - SE/HW/HP CAT. B

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE HIGH WING HORSEPOWER CATEGORY C

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 15	2	23.	1.50872	17.	2.28	40.
GROUP 16	4	44.	-.79364	50.	.53	94.
GROUP 17	1	5.	1.62565	2.	2.64	7.
GROUP 18	3	22.	-.52702	25.	.34	47.
TOTAL		94.		94.	5.94	188.

NO ROWS = 4 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FD	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 29. CHI-SQUARE ANALYSIS - EXPOSURE BASE - SF/HW/HP CAT. C

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE LOW WING HORSEPOWER CATEGORY B

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 22	1	30.	14.61258	3.	213.53	33.
GROUP 32	3	125.	-3.77271	175.	14.23	300.
GROUP 36	2	26.	13.93841	3.	194.28	29.
TOTAL		181.		181.	422.04	362.

NO ROWS = 3 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY	0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM 1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 30. CHI-SQUARE ANALYSIS - EXPOSURE BASE - SF/LW/HP CAT. B

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN RATING CATEGORY
SINGLE ENGINE LOW WING HORSEPOWER CATEGORY C

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 5	1	40.	2.78012	26.	7.73	66.
GROUP 6	5	9.	-2.14675	18.	4.61	27.
GROUP 7	3	108.	.83402	100.	.70	208.
GROUP 25	4	63.	.36744	60.	.14	123.
GROUP 26	2	16.	1.08671	12.	1.18	28.
GROUP 31	6	36.	-2.66892	56.	7.12	92.
TOTAL		272.		272.	21.48	544.

NO ROWS = 6 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 31. CHI-SQUARE ANALYSIS - EXPOSURE BASE - SE/LW/HP CAT. C

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN RATING CATEGORY
TWIN ENGINE HIGH WING HORSEPOWER CATEGORY D

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	2	22.	-.38609	24.	.15	46.
GROUP 21	1	11.	.62508	9.	.39	20.
TOTAL		33.		33.	.54	66.

NO ROWS = 2 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82900

FIGURE 32. CHI-SQUARE ANALYSIS - EXPOSURE BASE - TE/HW/HP CAT. D

CHI SQUARE ANALYSIS

OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE

BY GROUP WITHIN RATING CATEGORY

TWIN ENGINE LOW WING HORSEPOWER CATEGORY D

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 4	3	31.	-.60330	35.	.36	66.
GROUP 8	4	6.	-1.15714	10.	1.34	16.
GROUP 9	2	43.	1.90147	32.	3.62	75.
GROUP 20	5	26.	-1.69575	36.	2.88	62.
GROUP 30	6	37.	-2.62244	57.	6.88	94.
GROUP 33	1	47.	5.77924	21.	33.40	68.
TOTAL		190.		190.	48.48	380.

NO ROWS = 6 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 33. CHI-SQUARE ANALYSIS - EXPOSURE BASE - TE/LW/HP CAT. D

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN KIND OF FLYING
INSTRUCTION/TRAINING

TITLE	RATING ORDER	OBSERVED S/S ACC OCCURRENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	9	5.	9.13226	0.	83.40	5.
GROUP 2	1	14.	25.57496	0.	654.28	14.
GROUP 3	13	30.	6.18243	10.	38.22	40.
GROUP 4	31	0.	-.64906	0.	.41	0.
GROUP 5	27	11.	-.38376	12.	.15	23.
GROUP 6	21	1.	.54090	1.	.29	2.
GROUP 7	14	6.	4.25544	1.	18.11	7.
GROUP 8	25	0.	-.25151	0.	.06	0.
GROUP 9	7	12.	16.82712	1.	117.23	13.
GROUP 10	17	9.	3.71544	3.	13.81	12.
GROUP 11	34	168.	-4.09109	230.	16.74	398.
GROUP 12	8	9.	10.69885	1.	114.47	10.
GROUP 13	35	18.	-5.52119	61.	30.48	79.
GROUP 14	22	1.	.28382	1.	.08	2.
GROUP 15	30	0.	-.53021	0.	.28	0.
GROUP 16	33	1.	-2.04829	6.	4.40	7.
GROUP 17	26	0.	-.26574	0.	.08	0.
GROUP 18	32	0.	-1.07539	1.	1.16	1.
GROUP 19	20	5.	.65437	4.	.43	9.
GROUP 20	18	5.	2.94517	1.	8.67	6.
GROUP 21	15	2.	4.19575	0.	17.60	2.
GROUP 22	4	3.	15.42604	0.	237.96	3.
GROUP 23	19	6.	1.91946	3.	3.68	9.
GROUP 24	2	15.	20.79045	0.	432.26	15.
GROUP 25	16	10.	3.86926	3.	14.97	13.
GROUP 26	29	0.	-.51845	0.	.27	0.
GROUP 27	6	30.	11.17320	5.	124.84	35.
GROUP 28	10	13.	7.48338	2.	56.00	15.
GROUP 29	23	16.	-.10350	16.	.01	32.
GROUP 30	24	6.	-.23326	7.	.05	13.
GROUP 31	28	2.	-.47040	3.	.22	5.
GROUP 32	36	42.	-5.71182	114.	45.05	156.
GROUP 33	5	20.	14.84134	2.	220.27	22.
GROUP 34	11	3.	7.06104	0.	49.66	3.
GROUP 35	3	17.	17.71147	1.	313.70	18.
GROUP 36	12	13.	7.03970	2.	49.56	15.
TOTAL		493.		493.	2670.05	986.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FD	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 34. CHI-SQUARE ANALYSIS - KINDS OF FLYING - INSTRUCTION/TRAINING

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN KIND OF FLYING
POINT TO POINT TRANSPORTATION

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	31	7.	-2.37140	17.	5.62	24.
GROUP 2	7	3.	6.35427	0.	40.38	3.
GROUP 3	6	10.	6.77544	2.	45.91	12.
GROUP 4	20	21.	-.11078	22.	.01	43.
GROUP 5	15	5.	1.45203	3.	2.11	8.
GROUP 6	26	4.	-.91216	6.	.83	10.
GROUP 7	29	21.	-2.26447	34.	5.13	55.
GROUP 8	23	5.	-.31479	6.	.10	11.
GROUP 9	30	10.	-2.27120	20.	5.16	30.
GROUP 10	10	4.	3.87921	1.	15.05	5.
GROUP 11	14	9.	1.60785	5.	2.59	14.
GROUP 12	11	8.	3.73494	2.	13.95	10.
GROUP 13	24	17.	-.44468	19.	.24	36.
GROUP 14	21	2.	-.12988	2.	.02	4.
GROUP 15	19	11.	-.00302	11.	.00	22.
GROUP 16	32	17.	-2.45507	31.	6.03	48.
GROUP 17	18	3.	.05021	3.	.00	6.
GROUP 18	34	10.	-2.85000	24.	8.12	34.
GROUP 19	12	5.	1.68266	2.	2.83	7.
GROUP 20	35	8.	-3.00676	22.	9.04	30.
GROUP 21	27	3.	-1.20769	6.	1.46	9.
GROUP 22	8	3.	6.21922	0.	38.68	3.
GROUP 23	16	1.	.52414	1.	.28	2.
GROUP 24	4	6.	9.04496	0.	81.90	6.
GROUP 25	22	15.	-.23095	16.	.05	31.
GROUP 26	25	1.	-.61033	2.	.37	3.
GROUP 27	2	23.	19.92243	1.	396.90	24.
GROUP 28	1	47.	20.83553	4.	434.12	51.
GROUP 29	9	12.	4.21214	4.	17.74	16.
GROUP 30	36	10.	-3.77245	31.	14.23	41.
GROUP 31	33	6.	-2.54195	16.	6.46	22.
GROUP 32	28	12.	-1.99230	21.	3.97	33.
GROUP 33	17	13.	.38822	12.	.15	25.
GROUP 34	5	6.	7.19151	1.	51.72	7.
GROUP 35	3	8.	15.31540	0.	234.56	8.
GROUP 36	13	1.	1.65119	0.	2.73	1.
TOTAL		347.		347.	1448.44	694.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY	0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FD. 1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 35. CHI-SQUARE ANALYSIS - KINDS OF FLYING - POINT-TO-POINT TRANSPORTATION

CHI-SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN KIND OF FLYING
LOW ALTITUDE FLYING

TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	30	0.	-1.34484	2.	1.92	2.
GROUP 2	3	4.	9.51551	0.	90.54	4.
GROUP 3	4	17.	5.06274	5.	25.63	22.
GROUP 4	29	0.	-1.19574	1.	1.43	1.
GROUP 5	23	0.	-.75612	1.	.57	1.
GROUP 6	15	0.	-.37551	0.	.14	0.
GROUP 7	24	0.	-.89747	1.	.81	1.
GROUP 8	20	0.	-.60739	0.	.37	0.
GROUP 9	27	0.	-1.16175	1.	1.35	1.
GROUP 10	21	1.	-.61459	2.	.38	3.
GROUP 11	35	6.	-2.78543	18.	7.76	24.
GROUP 12	11	1.	.30705	1.	.09	2.
GROUP 13	33	1.	-2.34056	7.	5.48	8.
GROUP 14	17	0.	-.52145	0.	.28	0.
GROUP 15	34	2.	-2.43541	10.	5.94	12.
GROUP 16	36	0.	-2.90552	8.	8.46	8.
GROUP 17	31	0.	-1.40543	2.	1.98	2.
GROUP 18	32	1.	-1.56318	4.	2.44	5.
GROUP 19	9	1.	.67142	1.	.33	2.
GROUP 20	19	1.	-.57942	2.	.34	3.
GROUP 21	18	1.	-.57024	2.	.33	3.
GROUP 22	13	0.	-.03045	0.	.00	0.
GROUP 23	14	0.	-.27474	0.	.08	0.
GROUP 24	7	1.	1.05095	0.	1.10	1.
GROUP 25	10	1.	.39472	1.	.16	2.
GROUP 26	5	1.	3.00271	0.	9.02	1.
GROUP 27	2	20.	10.14022	3.	102.82	23.
GROUP 28	6	28.	2.92294	16.	8.54	44.
GROUP 29	26	0.	-1.05043	1.	1.10	1.
GROUP 30	12	2.	-.01546	2.	.00	4.
GROUP 31	22	0.	-.63189	0.	.40	0.
GROUP 32	28	0.	-1.17123	1.	1.37	1.
GROUP 33	25	0.	-.43171	1.	.87	1.
GROUP 34	8	1.	.93927	0.	.88	1.
GROUP 35	1	5.	14.69568	0.	215.96	5.
GROUP 36	16	0.	-.42519	0.	.18	0.
TOTAL		95.		95.	499.05	190.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY	0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM 1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 36. CHI-SQUARE ANALYSIS - KINDS OF FLYING - LOW ALTITUDE FLYING

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN KIND OF FLYING
PLEASURE/SOLO

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURRENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURRENCES	CHI SQUARE	TOTAL
GROUP 1	10	10.	3.84588	3.	14.79	13.
GROUP 2	4	48.	10.59007	12.	112.15	60.
GROUP 3	1	157.	15.69819	48.	246.43	205.
GROUP 4	9	7.	4.05909	2.	16.48	9.
GROUP 5	16	21.	.38022	19.	.14	40.
GROUP 6	27	3.	-2.97934	14.	8.88	17.
GROUP 7	20	80.	-.43715	84.	.19	164.
GROUP 8	21	1.	-.48598	2.	.24	3.
GROUP 9	12	19.	2.79567	10.	7.82	29.
GROUP 10	15	54.	.96440	47.	.93	101.
GROUP 11	13	136.	1.85264	116.	3.43	252.
GROUP 12	24	37.	-1.05105	44.	1.10	81.
GROUP 13	35	100.	-6.95970	198.	48.44	298.
GROUP 14	28	8.	-3.14723	23.	9.91	31.
GROUP 15	30	9.	-3.30681	26.	10.94	35.
GROUP 16	36	25.	-7.95532	107.	63.30	132.
GROUP 17	22	1.	-.62235	2.	.39	3.
GROUP 18	33	11.	-3.86071	33.	14.91	44.
GROUP 19	11	24.	2.97573	13.	8.86	37.
GROUP 20	18	11.	-.21656	12.	.05	23.
GROUP 21	19	4.	-.41842	5.	.18	9.
GROUP 22	7	24.	6.02892	7.	36.35	31.
GROUP 23	26	21.	-1.28057	28.	1.64	49.
GROUP 24	6	60.	6.92806	25.	48.00	85.
GROUP 25	31	37.	-3.58310	66.	12.84	103.
GROUP 26	25	13.	-1.15337	18.	1.33	31.
GROUP 27	2	122.	13.33699	39.	177.88	161.
GROUP 28	5	58.	8.60004	20.	73.97	78.
GROUP 29	32	52.	-3.69658	86.	13.67	138.
GROUP 30	23	19.	-.75269	23.	.57	42.
GROUP 31	29	28.	-3.28372	52.	10.78	80.
GROUP 32	34	67.	-6.67875	152.	47.32	219.
GROUP 33	14	13.	.98482	10.	.97	23.
GROUP 34	17	23.	.02629	23.	.00	46.
GROUP 35	3	79.	13.04622	20.	170.20	99.
GROUP 36	8	10.	4.14322	3.	17.17	13.
TOTAL		1392.		1392.	1182.25	2784.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY	0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM 1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 37. CHI-SQUARE ANALYSIS - KINDS OF FLYING - PLEASURF/SOLO

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS EXPECTED S/S ACC COMPUTED FROM EXPOSURE
BY GROUP WITHIN KIND OF FLYING
AERIAL APPLICATION

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	23	0.	-.61728	0.	.38	0.
GROUP 2	16	0.	-.44838	0.	.20	0.
GROUP 3	15	4.	-.42586	5.	.18	9.
GROUP 4	31	2.	-.83890	4.	.70	6.
GROUP 5	18	0.	-.48796	0.	.24	0.
GROUP 6	11	0.	-.33134	0.	.11	0.
GROUP 7	24	0.	-.63244	0.	.40	0.
GROUP 8	9	0.	-.23087	0.	.05	0.
GROUP 9	19	0.	-.51276	0.	.26	0.
GROUP 10	30	0.	-.83766	1.	.70	1.
GROUP 11	36	0.	-1.71730	3.	2.95	3.
GROUP 12	21	0.	-.53474	0.	.25	0.
GROUP 13	35	0.	-1.41688	2.	2.01	2.
GROUP 14	13	0.	-.35959	0.	.13	0.
GROUP 15	32	1.	-.91700	2.	.84	3.
GROUP 16	34	0.	-1.32916	2.	1.77	2.
GROUP 17	29	0.	-.79105	1.	.63	1.
GROUP 18	33	0.	-1.09179	1.	1.19	1.
GROUP 19	10	0.	-.30851	0.	.10	0.
GROUP 20	22	0.	-.59162	0.	.35	0.
GROUP 21	8	0.	-.21265	0.	.05	0.
GROUP 22	6	0.	-.17308	0.	.03	0.
GROUP 23	12	0.	-.34106	0.	.17	0.
GROUP 24	20	0.	-.53305	0.	.28	0.
GROUP 25	25	0.	-.63835	0.	.41	0.
GROUP 26	4	0.	-.12809	0.	.02	0.
GROUP 27	3	15.	.49229	13.	.24	28.
GROUP 28	2	79.	2.09659	62.	4.40	141.
GROUP 29	27	0.	-.76636	1.	.59	1.
GROUP 30	28	0.	-.77758	1.	.60	1.
GROUP 31	17	0.	-.48612	0.	.24	0.
GROUP 32	26	1.	-.72390	2.	.52	3.
GROUP 33	14	0.	-.39299	0.	.15	0.
GROUP 34	1	1.	3.90337	0.	15.24	1.
GROUP 35	7	0.	-.20583	0.	.04	0.
GROUP 36	5	0.	-.15152	0.	.03	0.
TOTAL		103.		103.	36.46	206.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FD	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 38. CHI-SQUARE ANALYSIS - KINDS OF FLYING - AERIAL APPLICATION

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS COMPUTED EXPECTED S/S ACC
BY GROUP WITHIN PHASE OF OPERATION
TAKE OFF

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	31	5.	-1.15847	8.	1.34	13.
GROUP 2	15	29.	.47376	27.	.22	56.
GROUP 3	35	68.	-1.91643	86.	3.67	154.
GROUP 4	1	22.	2.98537	12.	8.91	34.
GROUP 5	9	21.	1.49492	15.	2.23	36.
GROUP 6	24	3.	-.22440	3.	.05	6.
GROUP 7	14	46.	.78485	41.	.62	87.
GROUP 8	23	2.	-.18322	2.	.03	4.
GROUP 9	25	14.	-.57302	16.	.33	30.
GROUP 10	8	36.	1.66125	27.	2.76	63.
GROUP 11	32	106.	-1.46287	122.	2.14	228.
GROUP 12	5	31.	2.11593	21.	4.48	52.
GROUP 13	3	72.	2.52985	53.	6.40	125.
GROUP 14	20	4.	-.08492	4.	.01	8.
GROUP 15	7	14.	1.78523	9.	3.19	23.
GROUP 16	29	13.	-.90408	17.	.82	30.
GROUP 17	13	3.	.80080	2.	.64	5.
GROUP 18	28	6.	-.81235	8.	.66	14.
GROUP 19	4	22.	2.25700	14.	5.10	35.
GROUP 20	16	11.	.36151	10.	.13	21.
GROUP 21	26	3.	-.57441	4.	.33	7.
GROUP 22	22	11.	-.11329	11.	.01	22.
GROUP 23	18	11.	.11555	11.	.01	22.
GROUP 24	10	39.	1.26295	32.	1.60	71.
GROUP 25	27	21.	-.59371	24.	.35	45.
GROUP 26	11	9.	1.18899	6.	1.41	15.
GROUP 27	21	83.	-.09271	84.	.01	167.
GROUP 28	36	49.	-4.15928	88.	17.30	137.
GROUP 29	2	45.	2.65867	30.	7.07	75.
GROUP 30	17	15.	.25674	14.	.07	29.
GROUP 31	6	21.	1.98642	14.	3.95	35.
GROUP 32	30	41.	-.93309	47.	.87	88.
GROUP 33	19	18.	.03975	18.	.00	36.
GROUP 34	12	17.	1.02104	13.	1.04	30.
GROUP 35	33	32.	-1.60976	42.	2.59	74.
GROUP 36	34	4.	-1.86723	10.	3.44	14.
TOTAL		947.		947.	83.53	1894.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 39. CHI-SQUARE ANALYSIS - PHASE OF OPERATION - TAKEOFF

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS COMPUTED EXPECTED S/S ACC
BY GROUP WITHIN PHASE OF OPERATION
APPROACH/LANDING

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	11	4.	.70231	3.	.49	7.
GROUP 2	22	9.	.00856	9.	.00	18.
GROUP 3	36	15.	-2.59612	29.	6.74	44.
GROUP 4	5	7.	1.51769	4.	2.30	11.
GROUP 5	16	6.	.38497	5.	.15	11.
GROUP 6	10	2.	.78773	1.	.62	3.
GROUP 7	14	16.	.57883	14.	.34	30.
GROUP 8	1	3.	2.54347	1.	6.47	4.
GROUP 9	25	5.	-.21841	6.	.05	11.
GROUP 10	29	8.	-.40510	9.	.16	17.
GROUP 11	21	42.	.11174	41.	.01	83.
GROUP 12	8	10.	1.05264	7.	1.11	17.
GROUP 13	3	28.	2.33391	18.	5.45	46.
GROUP 14	15	2.	.49661	1.	.25	3.
GROUP 15	13	4.	.61221	3.	.37	7.
GROUP 16	6	9.	1.41425	6.	2.00	15.
GROUP 17	32	0.	-.80064	1.	.64	1.
GROUP 18	20	3.	.10687	3.	.01	6.
GROUP 19	18	5.	.17903	5.	.03	10.
GROUP 20	9	5.	.91287	3.	.83	8.
GROUP 21	7	3.	1.33868	1.	1.79	4.
GROUP 22	30	3.	-.43146	4.	.19	7.
GROUP 23	4	8.	2.32773	4.	5.42	12.
GROUP 24	26	10.	-.23440	11.	.05	21.
GROUP 25	28	7.	-.37893	8.	.14	15.
GROUP 26	12	3.	.66241	2.	.44	5.
GROUP 27	34	19.	-1.75343	28.	3.07	47.
GROUP 28	35	19.	-1.96994	30.	3.88	49.
GROUP 29	31	8.	-.70456	10.	.50	18.
GROUP 30	19	5.	.11773	5.	.01	10.
GROUP 31	27	4.	-.28645	5.	.08	9.
GROUP 32	2	26.	2.49159	16.	6.21	42.
GROUP 33	23	6.	-.01045	6.	.00	12.
GROUP 34	17	5.	.24209	4.	.06	9.
GROUP 35	33	8.	-1.67813	14.	2.82	22.
GROUP 36	24	3.	-.18257	3.	.03	6.
TOTAL		320.		320.	52.71	640.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 40. CHI-SQUARE ANALYSIS - PHASE OF OPERATION - APPROACH/LANDING

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS COMPUTED EXPECTED S/S ACC
BY GROUP WITHIN PHASE OF OPERATION
NORMAL ENROUTE

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	4	6.	2.80251	2.	7.85	8.
GROUP 2	21	6.	-.16663	6.	.03	12.
GROUP 3	35	12.	-1.91824	21.	3.68	33.
GROUP 4	33	0.	-1.68646	3.	2.84	3.
GROUP 5	17	4.	.17233	4.	.03	8.
GROUP 6	26	0.	-.90869	1.	.83	1.
GROUP 7	9	14.	1.29975	10.	1.69	24.
GROUP 8	24	0.	-.74194	1.	.55	1.
GROUP 9	2	10.	3.04843	4.	9.29	14.
GROUP 10	34	2.	-1.79201	7.	3.21	9.
GROUP 11	18	30.	.08418	30.	.01	60.
GROUP 12	23	4.	-.50198	5.	.25	9.
GROUP 13	19	13.	.01771	13.	.00	26.
GROUP 14	11	2.	.98625	1.	.97	3.
GROUP 15	30	0.	-1.45264	2.	2.11	2.
GROUP 16	14	5.	.47937	4.	.23	9.
GROUP 17	13	1.	.79915	0.	.64	1.
GROUP 18	20	2.	-.01297	2.	.00	4.
GROUP 19	28	1.	-1.26714	3.	1.61	4.
GROUP 20	25	1.	-.89701	2.	.80	3.
GROUP 21	10	2.	.98625	1.	.97	3.
GROUP 22	7	6.	1.95752	3.	3.83	9.
GROUP 23	15	3.	.26896	3.	.07	6.
GROUP 24	29	4.	-1.33523	8.	1.78	12.
GROUP 25	5	12.	2.58715	6.	6.69	18.
GROUP 26	27	0.	-1.21159	1.	1.47	1.
GROUP 27	32	13.	-1.61586	20.	2.61	33.
GROUP 28	36	6.	-3.31309	21.	10.98	27.
GROUP 29	12	10.	.98194	7.	.96	17.
GROUP 30	3	9.	3.04234	3.	9.26	12.
GROUP 31	22	3.	-.16666	3.	.03	6.
GROUP 32	6	20.	2.51932	11.	6.35	31.
GROUP 33	1	11.	3.22066	4.	10.37	15.
GROUP 34	8	6.	1.55632	3.	2.42	9.
GROUP 35	16	11.	.22597	10.	.05	21.
GROUP 36	31	0.	-1.54448	2.	2.39	2.
TOTAL		229.		229.	96.85	458.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 41. CHI-SQUARE ANALYSIS - PHASE OF OPERATION - NORMAL ENROUTE

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS COMPUTED EXPECTED S/S ACC
BY GROUP WITHIN PHASE OF OPERATION
CLIMB/DESCENT

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	14	1.	.26627	1.	.07	2.
GROUP 2	13	3.	.35857	2.	.13	5.
GROUP 3	36	3.	-1.73779	8.	3.02	11.
GROUP 4	32	0.	-1.03948	1.	1.08	1.
GROUP 5	34	0.	-1.18078	1.	1.34	1.
GROUP 6	24	0.	-.56009	0.	.31	0.
GROUP 7	21	3.	-.39399	4.	.16	7.
GROUP 8	22	0.	-.45731	0.	.21	0.
GROUP 9	35	0.	-1.22425	1.	1.50	1.
GROUP 10	29	1.	-.95293	3.	.91	4.
GROUP 11	30	8.	-.96221	11.	.93	19.
GROUP 12	10	3.	.75017	2.	.56	5.
GROUP 13	27	3.	-.86367	5.	.75	8.
GROUP 14	26	0.	-.61920	0.	.38	0.
GROUP 15	28	0.	-.89537	1.	.80	1.
GROUP 16	12	2.	.37657	2.	.14	4.
GROUP 17	3	1.	1.97793	0.	3.41	1.
GROUP 18	15	1.	.26627	1.	.07	2.
GROUP 19	33	0.	-1.12018	1.	1.25	1.
GROUP 20	2	3.	2.19938	1.	4.84	4.
GROUP 21	25	0.	-.61920	0.	.38	0.
GROUP 22	17	1.	-.04466	1.	.00	2.
GROUP 23	16	1.	.02433	1.	.00	2.
GROUP 24	7	5.	1.21098	3.	1.47	8.
GROUP 25	4	5.	1.89227	2.	3.58	7.
GROUP 26	11	1.	.59228	1.	.35	2.
GROUP 27	31	5.	-.97394	8.	.95	13.
GROUP 28	5	13.	1.72785	8.	2.99	21.
GROUP 29	23	2.	-.47217	3.	.22	5.
GROUP 30	1	4.	2.38663	1.	5.70	5.
GROUP 31	20	1.	-.22747	1.	.05	2.
GROUP 32	18	4.	-.17102	4.	.03	8.
GROUP 33	9	3.	1.06395	2.	1.13	5.
GROUP 34	19	1.	-.19914	1.	.04	2.
GROUP 35	6	7.	1.56703	4.	2.46	11.
GROUP 36	8	2.	1.14893	1.	1.32	3.
TOTAL		87.		87.	43.08	174.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 42. CHI-SQUARE ANALYSIS - PHASE OF OPERATION - CLIMB/DESCENT

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS COMPUTED EXPECTED S/S ACC
BY GROUP WITHIN PHASE OF OPERATION
TURNING FLIGHT

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	OBSERVED S/S ACC RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	17	1.	-.47135	2.	.22	3.
GROUP 2	18	4.	-.47763	5.	.23	9.
GROUP 3	7	18.	.39804	16.	.16	34.
GROUP 4	32	0.	-1.49933	2.	2.25	2.
GROUP 5	20	2.	-.52882	3.	.23	5.
GROUP 6	4	2.	1.66780	1.	2.78	3.
GROUP 7	2	14.	2.20412	8.	4.86	22.
GROUP 8	5	1.	.85641	0.	.73	1.
GROUP 9	30	1.	-1.19954	3.	1.44	4.
GROUP 10	26	3.	-.97207	5.	.94	8.
GROUP 11	34	12.	-2.34886	23.	5.52	35.
GROUP 12	33	0.	-2.01517	4.	4.06	4.
GROUP 13	36	2.	-2.57215	10.	6.52	12.
GROUP 14	9	1.	.22653	1.	.05	2.
GROUP 15	19	1.	-.51714	2.	.27	3.
GROUP 16	31	1.	-1.22642	3.	1.50	4.
GROUP 17	21	0.	-.60215	0.	.36	0.
GROUP 18	8	2.	.32037	2.	.10	4.
GROUP 19	28	1.	-.99681	3.	.99	4.
GROUP 20	10	2.	.08345	2.	.01	4.
GROUP 21	25	0.	-.89313	1.	.80	1.
GROUP 22	11	2.	-.11897	2.	.01	4.
GROUP 23	22	1.	-.72315	2.	.52	3.
GROUP 24	24	4.	-.84736	6.	.72	10.
GROUP 25	13	4.	-.26598	5.	.07	9.
GROUP 26	12	1.	-.14878	1.	.02	2.
GROUP 27	3	23.	1.74207	16.	3.03	39.
GROUP 28	1	54.	9.06369	17.	82.15	71.
GROUP 29	35	0.	-2.40859	6.	5.80	6.
GROUP 30	29	1.	-1.02752	3.	1.06	4.
GROUP 31	27	1.	-.99681	3.	.99	4.
GROUP 32	15	8.	-.35357	9.	.13	17.
GROUP 33	23	2.	-.76281	3.	.58	5.
GROUP 34	14	2.	-.33774	3.	.11	5.
GROUP 35	16	7.	-.39363	8.	.15	15.
GROUP 36	6	3.	.81172	2.	.66	5.
TOTAL		181.		181.	130.17	362.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 43. CHI-SQUARE ANALYSIS - PHASE OF OPERATION - TURNING FLIGHT

CHI SQUARE ANALYSIS
OBSERVED S/S ACC VS COMPUTED EXPECTED S/S ACC
BY GROUP WITHIN PHASE OF OPERATION
LOW ALT ENROUTE

ROW TITLE	RATING ORDER	OBSERVED S/S ACC OCCURENCES	RATING	EXPECTED S/S ACC OCCURENCES	CHI SQUARE	TOTAL
GROUP 1	17	1.	-.83642	2.	.70	3.
GROUP 2	16	5.	-.81341	7.	.66	12.
GROUP 3	2	45.	4.53224	23.	20.54	68.
GROUP 4	12	2.	-.66148	3.	.44	5.
GROUP 5	22	2.	-1.03806	4.	1.08	6.
GROUP 6	21	0.	-.96077	1.	.92	1.
GROUP 7	31	5.	-1.82589	11.	3.33	16.
GROUP 8	15	0.	-.78446	1.	.62	1.
GROUP 9	27	1.	-1.62388	4.	2.64	5.
GROUP 10	6	10.	.96244	7.	.93	17.
GROUP 11	4	42.	1.56163	33.	2.44	75.
GROUP 12	24	3.	-1.14479	6.	1.31	9.
GROUP 13	34	7.	-1.96210	14.	3.85	21.
GROUP 14	8	1.	-.12070	1.	.01	2.
GROUP 15	10	2.	-.23372	2.	.05	4.
GROUP 16	7	5.	.22933	5.	.05	10.
GROUP 17	13	0.	-.71611	1.	.51	1.
GROUP 18	26	0.	-1.50214	2.	2.26	2.
GROUP 19	19	2.	-.88070	4.	.78	6.
GROUP 20	28	0.	-1.63299	3.	2.67	3.
GROUP 21	9	1.	-.12070	1.	.01	2.
GROUP 22	11	2.	-.61394	3.	.38	5.
GROUP 23	23	1.	-1.10454	3.	1.22	4.
GROUP 24	20	6.	-.89104	9.	.79	15.
GROUP 25	30	2.	-1.75516	6.	3.08	8.
GROUP 26	25	0.	-1.28103	2.	1.64	2.
GROUP 27	5	28.	1.12022	23.	1.25	51.
GROUP 28	1	53.	5.98711	24.	35.85	77.
GROUP 29	14	6.	-.76982	8.	.59	14.
GROUP 30	33	0.	-1.94804	4.	3.79	4.
GROUP 31	32	0.	-1.92154	4.	3.69	4.
GROUP 32	35	5.	-2.18415	13.	4.77	18.
GROUP 33	36	0.	-2.19557	5.	4.82	5.
GROUP 34	18	2.	-.83906	4.	.70	6.
GROUP 35	3	17.	1.62655	11.	2.65	28.
GROUP 36	29	0.	-1.63299	3.	2.67	3.
TOTAL		256.		256.	113.69	512.

NO ROWS = 36 NO COLUMNS = 1 DEGREES OF FREEDOM = 1

PROBABILITY		0.250	0.100	0.050	0.025	0.010	0.005	0.001
DEG OF FDM	1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.82800

FIGURE 44. CHI-SQUARE ANALYSIS - PHASE OF OPERATION - LOW-ALTITUDE ENROUTE

APPENDIX

AIRSAFE CROSS-REFERENCE LISTING

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
01	00201	0141102	6A132	AERO COMMANDER	500
	00201	0141104	6A132	AERO COMMANDER	500A
	00201	0141106	6A132	AERO COMMANDER	500B
	00201	0141107	6A132	AERO COMMANDER	500S
	00201	0141108	6A132	AERO COMMANDER	500U
	00201	0141202	6A132	AERO COMMANDER	520
	00201	0141402	6A132	AERO COMMANDER	560
	00201]2)	0141404	6A132	AERO COMMANDER	560A
	1)[00201	0141406	6A132	AERO COMMANDER	560E
	00202	0141408	2A422	AERO COMMANDER	560F
	00202	0141602	2A422	AERO COMMANDER	680
	00202	0141604	2A422	AERO COMMANDER	680E
	00202	0141606	2A422	AERO COMMANDER	680F
	00202	0141608	2A422	AERO COMMANDER	680FL
	00202	0141610	2A422	AERO COMMANDER	680FLP
	00202	0141612	2A422	AERO COMMANDER	685
	00202	0141712	2A422	AERO COMMANDER	680T
	00202	0141714	2A422	AERO COMMANDER	680V
	00202	0141716	2A422	AERO COMMANDER	680W
	00202	0141718	2A422	AERO COMMANDER	681
02	00307	0190902	A7284	AERONCA	65TC
	00307	0190904	A7284	AERONCA	L3J
	00307	0190906	A7284	AERONCA	65TF
	00307	0190908	A7284	AERONCA	65TL
	00307	0190910	A7284	AERONCA	65TAC
	00307	0190914	A7284	AERONCA	65TAF
	00307	0190916	A7284	AERONCA	L30
	00307	0190918	A7284	AERONCA	65TAL
	00308]2)	0191102	A76114	AERONCA/TRYTEK	11AC
	00308	0191104	A76114	AERONCA/TRYTEK	S11AC
	1)[00309	0191106	A76114	AERONCA/TRYTEK	11BC
	00310	0191110	A79611	AERONCA/TRYTEK	11CC
	00311	0191202	A80217	AERONCA/TRYTEK	15AC
	00311	0191204	A80217	AERONCA/TRYTEK	S15AC
	00315	0190922	A6754	AERONCA/TRYTEK	65CA
	00315	0190928	A6754	AERONCA/TRYTEK	S65CA
	00316	0190930	A7025	AERONCA/TRYTEK	65LA
	00316	0190932	A7025	AERONCA/TRYTEK	65LB
	00316	0190934	A7025	AERONCA/TRYTEK	L3G
	00318	0190920	A6754	AERONCA/TRYTEK	65C
	00318	0191004	A7513	AERONCA/TRYTEK	L3A
	00318	0191010	A7513	AERONCA/TRYTEK	L3C
03	00312	0190107	A75954	AERONCA/LANE	7EC
	00312	1220438	A75954	AERONCA/BELLANCA	7ACA
	00312	1220460	A75954	AERONCA/BELLAN	7ECA
	00312	1220501	A75954	AERONCA/BELLAN	7GCAA
	00312	1220601	A75954	AERONCA/BELLAN	7GCBC
	00312	1220701	A75954	AERONCA/BELLAN	7KCAB

1) DIFERENT NTSB CODE FOR DIFFERENT SERIES WITHIN A MODEL

2) SAME NTSB CODE FOR DIFFERENT SERIES WITHIN A MODEL

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	4) FAS CODE	MANUFACTURER	MODEL/SERIES
03	00312	21101MA	A75954	AERONCA/CHAMPION	7AC
	00312	21101MF	A75954	AERONCA/CHAMPION	S7AC
	00312	21101ML	A75954	AERONCA/CHAMPION	7BCM
	00312	21101MW	A75954	AERONCA/CHAMPION	7CCM
	00312	21101NB	A75954	AERONCA/CHAMPION	7DC
	00312	21101NG	A75954	AERONCA/CHAMPION	S7DC
	00312	21101NM	A75954	AERONCA/CHAMPION	7EC
	00312	21101NN	A75954	AERONCA/CHAMPION	7ECA
	00312	21101NS	A75954	AERONCA/CHAMPION	S7EC
	00312	21101NX	A75954	AERONCA/CHAMPION	7FC
	00312	21101N2	A75954	AERONCA/CHAMPION	7GC
	00312	21101N7	A75954	AERONCA/CHAMPION	7GCA
	00312	21101N8	A75954	AERONCA/CHAMPION	7GCAA
	00312	21101PC	A75954	AERONCA/CHAMPION	7GCB
	00312	21101PH	A75954	AERONCA/CHAMPION	7GCBA
	00312	21101PK	A75954	AERONCA/CHAMPION	7GCBC
	00312	21101PN	A75954	AERONCA/CHAMPION	7HC
	00312	21101PT	A75954	AERONCA/CHAMPION	7JC
	00312	21101P3	A75954	AERONCA/CHAMPION	7KCAB
	00312	2110102	A75954	AERONCA	7AC
	00312	2110104	A75954	AERONCA	3) S7AC
	00312	2110106	A75954	AERONCA	7BCM
	00312	2110110	A75954	AERONCA	7CCM
	00312	2110112	A75954	AERONCA	L16B
	00312	2110114	A75954	AERONCA	S7CCM
	00312	2110116	A75954	AERONCA	7DC
	00312	2110120	A75954	AERONCA	7EC
	00312	2110122	A75954	AERONCA	S7EC
	00312	2110124	A75954	AERONCA	7FC
	00312	2110126	A75954	AERONCA	7GC
	00312	2110130	A75954	AERONCA	7GCB
	00312	2110140	A75954	AERONCA/CHAMPION	7AC
	00312	2110144	A75954	AERONCA/CHAMPION	7BCM
	00312	2110148	A75954	AERONCA/CHAMPION	7CCM
	00312	2110154	A75954	AERONCA/CHAMPION	7DC
	00312	2110158	A75954	AERONCA/CHAMPION	7EC
	00312	2110162	A75954	AERONCA/CHAMPION	7FC
	00312	2110164	A75954	AERONCA/CHAMPION	7GC
	00312	2110166	A75954	AERONCA/CHAMPION	7GCA
	00312	2110168	A75954	AERONCA/CHAMPION	7GCB
	00312	2110172	A75954	AERONCA/CHAMPION	7HC
04	02201	1150102	LTC12	BEECH	AT10
	02201	1150104	LTC12	BEECH	AT10BH
	02201	1150106	LTC12	BEECH	AT10GF
	02201	1150108	LTC12	BEECH	AT10GL
	02202	1150202	A25828	BEECH	AT11
	02202	1150204	A25828	BEECH	SNB1
	02215	1150802		BEECH	18S
	02216	1150902	A75722	BEECH	C18S

3) DIFFERENT FAA CODE FOR SAME SERIES WITHIN A MODEL

4) FEDERAL AVIATION SPECIFICATION FOR AIRCRAFT MODEL

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
04	02216	1150904	A75722	BEECH	C45
	02216	1150911	A75722	BEECH	UC45J
	02217	1151004	A76567	BEECH	D18S
	02217	1151006	A76567	BEECH	E18S
	02217	1151008	A76567	BEECH	E18S9700
	02217	1151010	A76567	BEECH	G18S
	02217	1151012	A76567	BEECH	H18
	02217	1151014	A76567	BEECH	C45G
	02217	1151015	A76567	BEECH	C45G
	02217	1151016	A76567	BEECH	TC45G
	02217	1151018	A76567	BEECH	C45H
	02217	1151019	A76567	BEECH	C45H
	02217	1151020	A76567	BEECH	TC45H
	02217	1151021	A76567	BEECH	RC45J
	02217	1151022	A76567	BEECH	TC45J
	02217	1151024	A76567	BEECH	SNB5
05	02225	1151202	A1CE21	BEECH	23
	02225	1151204	A1CE21	BEECH	A23
	02225	1151208	A1CE21	BEECH	A23A
	02225	1151212	A1CE21	BEECH	A2319
	02225	1151214	A1CE21	BEECH	19A
	02225	1151215	A1CE21	BEECH	B19
	02225	1151226		BEECH	A23-24
	02225	1151226	A1CE21	BEECH	A2324
	02225	1151230	A1CE21	BEECH	24R
	02225	1151240	A1CE21	BEECH	B23
	02225	1151242	A1CE21	BEECH	C23
	02225	1151250	A1CE21	BEECH	A24
	02225	1151252	A1CE21	BEECH	A24R
06	02220	1151402	3A1550	BEECH	3533
	02220	1151404	3A1550	BEECH	35A33
	02220	1151406	3A1550	BEECH	35B33
	02220	1151408	3A1550	BEECH	35C33
	02220	1151410	3A1550	BEECH	35C33A
	02220	1151422	3A1552	BEECH	F33
	02220	1151423	3A1552	BEECH	F33
	02220	1151424	3A1552	BEECH	E33A
	02220	1151425	3A1552	BEECH	F33A
	02220	1151432	3A1552	BEECH	E33C
07	02219	1151502	A77752	BEECH	35
	02219	1151504	A77750	BEECH	A35
	02219	1151506	A77750	BEECH	B35
	02219	1151508	A77750	BEECH	C35
	02219	1151510	A77750	BEECH	D35
	02219	1151512	A77750	BEECH	E35
	02219	1151514	A77750	BEECH	F35
	02219	1151516	A77750	BEECH	G35

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
07	02219	1151518	3A1550	BEECH	35R
	02220	1151520	3A1550	BEECH	H35
	02220	1151522	3A1550	BEECH	J35
	02220	1151524	3A1550	BEECH	K35
	02220	1151526	3A1550	BEECH	M35
	02220	1151528	3A1550	BEECH	N35
	02220	1151530	3A1550	BEECH	P35
	02220	1151532	3A1550	BEECH	S35
	02220	1151538	3A1550	BEECH	V35
	02220	1151540		BEECH	V35TC
	02220	1151544	3A1550	BEECH	V35A
	02220	1151546		BEECH	V35ATC
	02220	1151548	3A1552	BEECH	V35B
	02220	1151602	3A1550	BEECH	36
	02220	1151604	3A1550	BEECH	A36
08	02222	1152502	5A455	BEECH	50
	02222	1152506	5A455	BEECH	B50
	02222	1152510	5A455	BEECH	C50
	02222	1152512	5A455	BEECH	D50
	02222	1152516	5A455	BEECH	D50A
	02222	1152518	5A455	BEECH	D50B
	02222	1152520	5A455	BEECH	D50C
	02222	1152522	5A455	BEECH	D50E
	02222	1152524	5A455	BEECH	E50
	02222	1152530	5A455	BEECH	F50
	02222	1152532	5A455	BEECH	G50
	02222	1152534	5A455	BEECH	H50
	02222	1152536	5A455	BEECH	J50
09	02224	1152702	3A1646	BEECH	95S5
	02224	1152704	3A1646	BEECH	95A55
	02224	1152706	3A1646	BEECH	95B55
	02224	1152708	3A1646	BEECH	95C55
	02224	1152730	3A1646	BEECH	D55
	02224	1152732	3A1647	BEECH	E55
	02224	1153402	3A1646	BEECH	95
	02224	1153404	3A1646	BEECH	B95
	02224	1153406	3A1646	BEECH	B95A
	02224	1153408	3A1646	BEECH	D95A
	02224	1153410	3A1647	BEECH	E95
10	03910	2071402	A76833	CESSNA	120
	03910	2071602	A76833	CESSNA	140
	03911	2071604	5A219	CESSNA	140A
11	03912	2071802	3A1921	CESSNA	150
	03912	2071804	3A1921	CESSNA	150A
	03912	2071806	3A1921	CESSNA	150B
	03912	2071808	3A1921	CESSNA	150C

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
11	03912	2071810	3A1921	CESSNA	150D
	03912	2071812	3A1921	CESSNA	150E
	03912	2071814	3A1921	CESSNA	150F
	03912	2071816	3A1921	CESSNA	150G
	03912	2071818	3A1921	CESSNA	150H
	03912	2071820	3A1921	CESSNA	150J
	03912	2071822	3A1921	CESSNA	150K
	03912	2071824	3A1921	CESSNA	A150K
	03912	2071826	3A1921	CESSNA	150L
	03912	2071828	3A1921	CESSNA	A150L
12	03913	2072302	A79945	CESSNA	170
	03913	2072304	A79945	CESSNA	170A
	03913	2072306	A79945	CESSNA	170B
13	03914	2072402	3A1236	CESSNA	172
	03914	2072404	3A1236	CESSNA	172A
	03914	2072406	3A1236	CESSNA	172B
	03914	2072408	3A1236	CESSNA	172C
	03914	2072410	3A1236	CESSNA	172D
	03914	2072412	3A1236	CESSNA	172E
	03914	2072414	3A1236	CESSNA	172F
	03914	2072420	3A1236	CESSNA	172G
	03914	2072424	3A1236	CESSNA	172H
	03914	2072426	3A1236	CESSNA	172I
	03914	2072430	3A1236	CESSNA	172K
	03914	2072432	3A1236	CESSNA	172L
14	03915	2072202	3A1725	CESSNA	P172D
	03915	2072413	3A1725	CESSNA	R172E
	03915	2072502	3A1725	CESSNA	175
	03915	2072504	3A1725	CESSNA	175A
	03915	2072506	3A1725	CESSNA	175B
	03915	2072508	3A1725	CESSNA	175C
15	03916	2072602	5A647	CESSNA	180
	03916	2072604	5A647	CESSNA	180A
	03916	2072606	5A647	CESSNA	180B
	03916	2072608	5A647	CESSNA	180C
	03916	2072610	5A647	CESSNA	180D
	03916	2072612	5A647	CESSNA	180E
	03916	2072614	5A647	CESSNA	180F
	03916	2072616	5A647	CESSNA	180G
	03916	2072618	5A647	CESSNA	180H
16	03917	2072702	3A1327	CESSNA	182
	03917	2072704	3A1327	CESSNA	182A
	03917	2072706	3A1327	CESSNA	182B
	03917	2072708	3A1327	CESSNA	182C
	03917	2072710	3A1327	CESSNA	182D

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
16	03917	2072712	3A1327	CESSNA	182E
	03917	2072714	3A1327	CESSNA	182F
	03917	2072716	3A1327	CESSNA	182G
	03917	2072718	3A1327	CESSNA	182H
	03917	2072722	3A1327	CESSNA	182J
	03917	2072724	3A1327	CESSNA	182K
	03917	2072726	3A1327	CESSNA	182L
	03917	2072728	3A1327	CESSNA	182M
	03917	2072730	3A1327	CESSNA	182N
17	03926	2072802	3A2417	CESSNA	185
	03926	2072804	3A2417	CESSNA	185A
	03926	2072806	3A2417	CESSNA	185B
	03926	2072808	3A2417	CESSNA	185C
	03926	2072812	3A2417	CESSNA	185D
	03926	2072816	3A2417	CESSNA	185E
	03926	2072818	3A2417	CESSNA	A185E
18	03919	2073202	3A2123	CESSNA	205
	03919	2073204	3A2123	CESSNA	205A
	03919	2073402	3A2123	CESSNA	210
	03919	2073403	3A2123	CESSNA	T210
	03919	2073404	3A2123	CESSNA	2105
	03919	2073406	3A2123	CESSNA	2105A
	03919	2073408	3A2123	CESSNA	210A
	03919	2073410	3A2123	CESSNA	210B
	03919	2073412	3A2123	CESSNA	210C
	03919	2073414	3A2123	CESSNA	210D
	03919	2073416	3A2123	CESSNA	210E
	03919	2073418	3A2123	CESSNA	210F
	03919	2073422	3A2123	CESSNA	T210F
	03919	2073430	3A2123	CESSNA	210G
	03919	2073432	3A2123	CESSNA	T210G
	03919	2073436	3A2123	CESSNA	210H
	03919	2073438	3A2123	CESSNA	T210H
	03919	2073439	3A2123	CESSNA	210J
	03919	2073440	3A2123	CESSNA	T210J
	03919	2073446	3A2123	CESSNA	210K
	03919	2073447	3A2123	CESSNA	T210K
	03929	2073302	A4CE15	CESSNA	206
	03929	2073304	A4CE15	CESSNA	P206
	03929	2073306	A4CE15	CESSNA	U206
	03929	2073308	A4CE15	CESSNA	P206A
	03929	2073309	A4CE15	CESSNA	P206B
	03929	2073310	A4CE15	CESSNA	TP206A
	03929	2073311	A4CE15	CESSNA	TP206B
	03929	2073312	A4CE15	CESSNA	P206C
	03929	2073313	A4CE15	CESSNA	TP206C
	03929	2073316	A4CE15	CESSNA	U206A
	03929	2073318	A4CE15	CESSNA	TU206A

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
18	03929	2073322	A4CE15	CESSNA	U206B
	03929	2073324	A4CE15	CESSNA	TU206B
	03929	2073332	A4CE15	CESSNA	U206C
	03929	2073334	A4CE15	CESSNA	TU206C
	03929	2073338	A4CE15	CESSNA	P206D
	03929	2073340	A4CE15	CESSNA	TP206D
	03929	2073342	A4CE15	CESSNA	U206D
	03929	2073344	A4CE15	CESSNA	TU206D
	03929	2073346	A4CE15	CESSNA	P206E
	03929	2073348	A4CE15	CESSNA	TP206E
	03929	2073350	A4CE15	CESSNA	U206E
	03929	2073352	A4CE15	CESSNA	TU206E
19	03933	2073704	A13CE13	CESSNA	177
	03933	2073706	A13CE13	CESSNA	177A
	03933	2073708	A13CE13	CESSNA	177B
20	03922	2074202	3A1038	CESSNA	310
	03922	2074204	3A1038	CESSNA	310A
	03922	2074208	3A1038	CESSNA	310B
	03922	2074210	3A1038	CESSNA	310G
	03922	2074212	3A1038	CESSNA	310D
	03922	2074214	3A1038	CESSNA	310E
	03922	2074216	3A1038	CESSNA	310F
	03922	2074218	3A1038	CESSNA	310G
	03922	2074220	3A1038	CESSNA	310H
	03922	2074222	3A1038	CESSNA	E310H
	03922	2074224	3A1038	CESSNA	310I
	03922	2074226	3A1038	CESSNA	310J
	03922	2074228	3A1038	CESSNA	310K
	03922	2074230	3A1038	CESSNA	310L
	03922	2074234	3A1038	CESSNA	310N
	03922	2074238	3A1038	CESSNA	310P
	03922	2074240	3A1038	CESSNA	T310P
	03922	2074242	3A1038	CESSNA	310Q
	03922	2074244	3A1038	CESSNA	T310Q
21	03930	2075602	A6CE20	CESSNA	336
	03930	2075702	A6CE20	CESSNA	337
	03930	2075704	A6CE20	CESSNA	337A
	03930	2075706	A6CE20	CESSNA	337B
	03930	2075707	A6CE20	CESSNA	T337B
	03930	2075712	A6CE20	CESSNA	337C
	03930	2075714	A6CE20	CESSNA	T337C
	03930	2075717	A6CE20	CESSNA	337D
	03930	2075719	A6CE20	CESSNA	T337D
	03930	2075721	A6CE20	CESSNA	337E
	03930	2075723	A6CE20	CESSNA	T337E
	03930	2075725	A6CE20	CESSNA	337F
22	16201	9230102	76611	GLOBE	GC1A

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
22	16201	9230104	76611	GLOBE	GC1B
	16201	9230106	76611	GLOBE/TEMCO	GC1A
	16201	9230108	76611	GLOBE/TEMCO	GC1B
	16201	9230110	76611	GLOBE/UNIVERSAL	GC1A
	16201	9230112	76611	GLOBE/UNIVERSAL	GC1B
23	06301	0420332	A71825	FORNEY	415C
	06301	0420334	A71825	FORNEY	415CD
	06301	0420336	A71825	FORNEY	415D
	06302	0420102	A78728	FORNEY/AIRCOUPE	F1
	06302	0420104	A78728	FORNEY/AIRCOUPE	F1A
	06302	0420202	A78728	FORNEY	F1
	06302	0420204	A78728	FORNEY	F1A
	06302	0420302	A78728	FORNEY/ENGR+RES	415C
	06302	0420304	A78728	FORNEY/ENGR+RES	415CD
	06302	0420306	A78728	FORNEY/ENGR+RES	415D
	06302	0420308	A78728	FORNEY/ENGR+RES	415E
	06302	0420310	A78728	FORNEY/ENGR+RES	415G
	06302	0420312	A78728	FORNEY/ENGR+RES	ER415C
	06302	0420314	A78728	FORNEY/ENGR+RES	ER415CD
	06302	0420316	A78728	FORNEY/ENGR+RES	ER415D
	06302	0420318	A78728	FORNEY/ENGR+RES	ER415E
	06302	0420320	A78728	FORNEY/ENGR+RES	ER415G
	06302	0420322	A78728	FORNEY/ERCOUPE	415C
	06302	0420324	A78728	FORNEY/ERCOUPE	415CD
	06302	0420326	A78728	FORNEY/ERCOUPE	415D
	06302	0420328	A78728	FORNEY/ERCOUPE	415E
	06302	0420330	A78728	FORNEY/ERCOUPE	415G
	06302	0420502	A78728	FORNEY	E
	06302	0420504	A78728	FORNEY/ERCOUPE	E
	06302	0420702	A78728	FORNEY	G
	06302	0420722	A78728	FORNEY/ERCOUPE	G
	06302	0540102	A78728	FORNEY/ALON	A2
	06302	0540104	A78728	FORNEY/ALON	A2A
	06302	5872014	A78728	FORNEY/MOONEY	A2A
	06302	5872018	A78728	FORNEY/MOONEY	M10
24	08902	8190102	A69422	LUSCOMBE	8
	08903	8190104	A69422	LUSCOMBE	8A
	08903	8190106	A69422	LUSCOMBE	8B
	08903	8190108	A69422	LUSCOMBE	8C
	08903	8190110	A69422	LUSCOMBE	8D
	08903	8190112	A69422	LUSCOMBE	8E
	08903	8190114	A69422	LUSCOMBE	8
	08903	8190116	A69422	LUSCOMBE	T8F
	08903	8190118	A69422	LUSCOMBE/SILVAIRE	8
	08903	8190120	A69422	LUSCOMBE/SILVAIRE	8A
	08903	8190122	A69422	LUSCOMBE/SILVAIRE	8B
	08903	8190124	A69422	LUSCOMBE/SILVAIRE	8C
	08903	8190126	A69422	LUSCOMBE/SILVAIRE	8D

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
24	08903	8190128	A69422	LUSCOMBE/SILVAIRE	8F
	08903	8190130	A69422	LUSCOMBE/SILVAIRE	8F
	08903	8190132	A69422	LUSCOMBE/SILVAIRE	T8F
	08903	8190154	A69422	SILVAIRE	8F
25	10102	5870202	2A321	MOONEY	M20
	10102	5870204	2A321	MOONEY	M20A
	10102	5870206	2A321	MOONEY	M20B
	10103	5870208	2A321	MOONEY	M20C
	10103	5870210	2A321	MOONEY	M20D
	10103	5870212	2A321	MOONEY	M20E
	10103	5870214	2A321	MOONEY	M20F
	10103	5870216	2A321	MOONEY	M20G
26	10701	6150104	A78245	NAVION	A
	10701	6150106	A78245	NAVION	L17A
	10701	6150108	A78245	NAVION	L17B
	10701	6150112	A78245	NAVION	B
	10701	6150114	A78245	NAVION	D
	10701	6150118	A78245	NAVION	F
	10701	6150120	A78245	NAVION	G
	10701	6150122	A78245	NAVION	H
	10701	6150130	A78245	NAVION/N.AMERICAN	NAVION
	10701	6150132	A78245	NAVION/N.AMERICAN	NAVIONA
	10701	6150134	A78245	NAVION/N.AMERICAN	NAVIONL17A
	10701	6150136	A78245	NAVION/N.AMERICAN	NAVIONL17B
	10701	6150140	A78245	NAVION/N.AMERICAN	NAVIONB
	10701	6150148	A78245	NAVION/N.AMERICAN	NAVIONG
	10701	6150160	A78245	NAVION/RYAN	NAVION
	10701	6150162	A78245	NAVION/RYAN	NAVIONA
	10701	6150164	A78245	NAVION/RYAN	NAVIONL17A
	10701	6150170	A78245	NAVION/RYAN	NAVIONB
	10701	6150174	A78245	NAVION/RYAN	NAVIONE
	10701	6150178	A78245	NAVION/RYAN	NAVIONG
	10701	7150110	A78245	NAVION	L17C
27	12404	7100502		PIPER	J3
	12405	7100503	A69130	PIPER	J3C
	12405	7100510	A69130	PIPER	J3C65
	12405	7100514	A69130	PIPER	L4A
	12405	7100525		PIPER	J3C85
	12405	7100526	A69130	PIPER	J3C65S
	12405	7101102	A69130	PIPER	PA11
	12405	7101104	A69130	PIPER	PA11S
	12406	7100528	A69212	PIPER	J3F50
	12406	7100532	A69212	PIPER	J3F60
	12406	7100536	A69212	PIPER	J3F65
	12407	7100542	A69812	PIPER	J3L
	12407	7100546	A69812	PIPER	J3L65
	12415	7101202		PIPER	PA12

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
28	12420	7101802	1A233	PIPER	PA18
	12420	7101806	1A233	PIPER	PA18S
	12420	7101808	1A233	PIPER	PA18105SPE
	12420	7101809	1A233	PIPER	PA18105
	12420	7101810	1A233	PIPER	PA18S105SP
	12420	7101812	1A233	PIPER	PA18125
	12420	7101814	1A233	PIPER	L21A
	12420	7101816	1A233	PIPER	PA18AS125
	12420	7101820	1A233	PIPER	PA18135
	12420	7101822	1A233	PIPER	PA18A135
	12420	7101824	1A233	PIPER	PA18AS135
	12420	7101828	1A233	PIPER	PA18150
	12420	7101832	1A233	PIPER	PA18S150
	12420	7101837	AR79	PIPER	PA18A150
	12421	7101804	1A233	PIPER	PA18A
	12421	7101834	AR79	PIPER	PA18ARESTR
	12421	7101836	AR79	PIPER	PA18A135
	12421	7101838	AR79	PIPER	PA18150
29	12423	7102202	1A631	PIPER	PA22
	12423	7102204	1A631	PIPER	PA22108
	12423	7102206	1A631	PIPER	PA22135
	12423	7102208	1A631	PIPER	PA22S135
	12423	7102210	1A631	PIPER	PA22150
	12423	7102212	1A631	PIPER	PA22S150
	12423	7102214	1A631	PIPER	PA22160
30	12424	7102302	1A1043	PIPER	PA23
	12424	7102303	1A1043	PIPER	PA23150
	12424	7102304	1A1043	PIPER	PA23160
	12424	7102306	1A1043	PIPER	PA23235
	12424	7102308	1A1043	PIPER	PA23250
	12424	7102309	1A1043	PIPER	PAE23250
31	12425	7102402	1A1527	PIPER	PA24
	12425	7102403	1A1527	PIPER	PA24180
	12425	7102404	1A1527	PIPER	PA24250
	12425	7102406	1A1527	PIPER	PA24260
	12425	7102408	1A1527	PIPER	PA24400
	12425	7102409	1A1527	PIPER	PA24400
32	12428	7102801	2A1330	PIPER	PA28
	12428	7102802	2A1330	PIPER	PA28140
	12428	7102804	2A1330	PIPER	PA28150
	12428	7102806	2A1330	PIPER	PA28160
	12428	7102808	2A1330	PIPER	PA28180
	12428	7102809	2A1330	PIPER	PA28R180
	12428	7102810	2A1330	PIPER	PA28235
	12428	7102811	2A1330	PIPER	PA28R200
	12428	7102824	2A1330	PIPER	PA28260

AIRSAFE CROSS REFERENCE LISTING

GROUP	NTSB CODE	FAA CODE	FAS CODE	MANUFACTURER	MODEL/SERIES
33	12429	7103002	A1EA10	PIPER	PA30
	12429	7103902	A1EA10	PIPER	PA39
34	16202	8632106	A1EA10	STINSON	108
	16202	8632107	A1EA10	STINSON	1083
	16202	9230402	A76724	STINSON	108
	16202	9230404	A76724	STINSON	1081
	16202	9230406	A76724	STINSON	1082
	16202	9230408	A76724	STINSON	1083
	16202	9230412	A76724	STINSON/UNIVERSAL	108
	16202	9230414	A76724	STINSON/UNIVERSAL	1081
	16202	9230416	A76724	STINSON/UNIVERSAL	1082
	16202	9230418	A76724	STINSON/UNIVERSAL	1083
35	15705	8850302	A69616	TAYLORCRAFT	BC
	15705	8850306	A69616	TAYLORCRAFT	BC65
	15705	8850310	A69616	TAYLORCRAFT	BC1265
	15705	8850314	A69616	TAYLORCRAFT	BCS1265
	15705	8850316	A69616	TAYLORCRAFT	BC12D
	15705	8850318	A69616	TAYLORCRAFT	BCS12D
	15705	8850320	A69616	TAYLORCRAFT	BC12D1
	15705	8850322	A69616	TAYLORCRAFT	BC12D85
	15705	8850323	A69616	TAYLORCRAFT	BC12D485
	15705	8850324	A69616	TAYLORCRAFT	BCS12D485
	15705	9230916	A69616	TAYLORCRAFT/UNIVERSAL	BC12D
	15705	9230924	A69616	TAYLORCRAFT/UNIVERSAL	BC12D85
	15705	9230926	A69616	TAYLORCRAFT/UNIVERSAL	BC12D485
	15705	9230928	A69616	TAYLORCRAFT/UNIVERSAL	BCS12D85
	15706	8850326	A6995	TAYLORCRAFT	BF
	15706	8850336	A6995	TAYLORCRAFT	BF65
	15706	8850340	A6995	TAYLORCRAFT	BF1265
	15707	8850346	A7005	TAYLORCRAFT	BL
	15707	8850350	A7005	TAYLORCRAFT	BL65
	15707	8850356	A7005	TAYLORCRAFT	BL1265
	15708	8850402	A7465	TAYLORCRAFT	DC65
	15708	8850408	A7465	TAYLORCRAFT	DC056
	15708	8850414	A7465	TAYLORCRAFT	L2M
	15708	8850416	A7465	TAYLORCRAFT	DF65
36	05603	0630610		AMERICAN	AA-1
	05603	0630710		AMERICAN	AA-1A
	05603	0630810		AMERICAN	AA-2
	05603	0630820		AMERICAN	AA-1B
	05603	0631202		AMERICAN	AA1B-000
	05603	0631214		AMERICAN	AA-1C
	05603	0632001		GRUMMAN/AMERICAN	AA-1B